Exhibit 2F

Los Osos Wastewater Project
Preliminary Engineering Report

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CHAPTER 1: PROJECT SUMMARY

1.1. BACKGROUND

The community of Los Osos, California is an unincorporated community situated about mid-way on the coastline of San Luis Obispo County, at the southern end of Morro Bay and adjacent to the Morro Bay National Estuary and State Marine Reserve. It is surrounded by Morro Bay, the Pacific Ocean, Montana de Oro State Park, open space preserves, and prime agricultural lands. The population of the community is approximately 15,000 residents. Drinking water is obtained by means of well extraction from the Los Osos groundwater basin, a multi-level aquifer underlying the Los Osos community. The basin is comprised of an upper and a lower aquifer separated by an impermeable layer of clay, which thereby restricts the vertical movement of groundwater.

The physical development of Los Osos began in the late 19th Century with the division of land into a grid of long, narrow residential lots located on wide streets. By the early 1960's, a community of summer homes and retreats had been developed. The community's permanent population grew steadily during the 1970's and into the mid-1980's, with the absence of a central wastewater collection and treatment system. Consequently, sanitation needs were met primarily through individual septic systems with septic pits, leachfields and similar methods. Today, wastewater treatment for the community continues to consist of privately owned, individual septic systems serving each developed property, or in some cases multiple properties.

The Regional Water Quality Control Board – Central Coast Region (RWQCB) determined in 1983 that contamination in excess of the State standards had occurred in the groundwater basin (upper aquifer) at least partially due to use of the septic systems throughout the community. Therefore, in January 1988, the State Water Resources Control Board approved an amendment to the Water Quality Control Plan, Central Coastal Basin. The amendment contained the discharge moratorium established by the RWQCB for a portion of the Los Osos area known as the "Prohibition Zone" (Figure 2-2). By prohibiting discharge from additional individual and community sewage disposal systems, the moratorium effectively halted new construction or major expansions of existing development until the water pollution problem was solved. In effect, the regulatory actions necessitated the development of a community wastewater system to collect, treat, and dispose/reuse the wastewater.

1.2. EARLY PROJECT EFFORTS BY COUNTY

Since the establishment of the Prohibition Zone, there have been many attempts to rectify the situation through construction of a wastewater project. The County produced a plan and Environmental Impact Report (EIR) by 1987 for a wastewater treatment system that was composed of conventional collection, treatment and disposal technologies, with the treatment plant site located in a rural area northeast of the community near the westerly end of Turri Road. The County prepared a Supplemental EIR in 1988 and began the design process. However, the project was delayed by litigation and other issues. By the mid-1990's the planned treatment plant site was moved to a partially developed area on the eastern side of the Los Osos community. This site change necessitated preparation of a second supplemental EIR (1997). For a variety of reasons, the conventional wastewater collection and treatment system evaluated by the 1997 supplemental EIR, did not enjoy community-wide support. Overriding concerns with the project related to project costs and feasibility of the effluent disposal plan.

1.3. LOS OSOS COMMUNITY SERVICES DISTRICT

Community opposition to the County's planned project led to the formation of the "Solutions Group," a coalition of community members with a vision for an alternative sewer project. The plan included a STEP collection system, facultative pond treatment, and community amenities, such as a park, in the project description. In 1998, the community voted to establish a community services district with wastewater authority and elected members of the "Solutions Group" to the Board of Directors. The Los Osos Community Services District (LOCSD) prepared a project EIR, began the design process, and purchased a treatment plant site located in the west-central portion of the community (referred to as both the "Tri-W" and "Mid-Town" site). By the time the LOCSD certified the EIR in 2001, the alternative technologies had been removed in favor of a conventional gravity collection system and extended aeration treatment process.

The LOCSD did not receive final approval of the Coastal Development Permit (CDP) and start construction until mid-2005. By that time, there was growing community opposition to the project, focused primarily on project costs and the Mid-Town treatment plant site. In the fall of 2005, the voters in Los Osos recalled a majority of the LOCSD board members in a special election. The new board immediately halted construction on the wastewater project. In August 2006, the LOCSD rescinded certification of the 2001 EIR and filed for federal bankruptcy protection due to default on construction and financing contracts.

In response to the community vote to effectively stop the wastewater project, which was in construction, the RWQCB began to take regulatory enforcement action against individual property owners for violation of the septic tank discharge prohibition. The RWQCB initial sent Cease and Desist orders to 45 property owners and has subsequently sent a Notice of Violation to all property owners within the prohibition zone. The RWQCB established a deadline of January 1, 2011, after which property owners will face fines if substantial progress has not been made to complete the project.

1.4. CURRENT COUNTY EFFORTS UNDER AB 2701 (BLAKESLEE, 2006)

After the recall and suspension of construction, California Assemblyman Sam Blakeslee attempted to resolve the dispute between the State Water Board, which was the funding agency, and the LOCSD. When a compromise could not be reached, Assemblyman Blakeslee proposed special legislation, Assembly Bill (AB) 2701, to authorize transfer of wastewater authority from the LOCSD to the County of San Luis Obispo. AB 2701 was passed unanimously by the California State legislature and signed into law by Governor Arnold Schwarzenegger. It became effective on January 1, 2007.

Among its key provisions, AB 2701 required that the County determine whether property owners would authorize local assessments pursuant to Proposition 218, which is commonly referred to as the "Right to Vote on Taxes Act" and which is incorporated into the California State Constitution. The County's first task was the development of a Rough Screening Report and a Fine Screening Report. These documents focused on identifying a set of viable project alternatives and cost estimates for those alternatives. The cost estimates were the basis for the Proposition 218 assessment vote.

In October, 2007, the assessments were approved with 80% of property owner ballots in support. The assessments have since been established as liens on properties in an amount that varies by property but is equivalent to $24,941 per single family dwelling unit and total $126,722,296. Consequently, project funding has been substantially secured for the Los Osos Wastewater Project (LOWWP). A separate assessment ballot process for vacant properties is planned prior to the final implementation of the wastewater project. However, the liens assessed to developed properties in the 2007 proceedings represent approximately 78% of the total capital cost of the proposed project, including capitalized interest.

Following the successful Proposition 218 vote, the County completed a co-equal environmental review process to meet the requirements of the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). The project draft EIR was released in November, 2008, and the final EIR was adopted by the County Board of Supervisors on September 29, 2009. The County has also applied for all state and federal environmental permits; however, as a result of the "due-diligence" provisions of AB 2701, is waiting for final issuance of key permits, including the Coastal Development Permit, before proceeding with final design or project bids.

1.5. SUMMARY OF APPROVED PROJECT

The final approved project description in the EIR process consists of the following components:

Collection System

A gravity collection system is planned for Los Osos. A full collection system design was completed by the Los Osos CSD in 2004, prior to their cessation of the project and the passage of AB 2701. This existing design is the basis of the current planning and environmental permitting process. The collection system will consist of the following:

- Approximately 45 miles of pipelines, plus service laterals
- Nine major duplex and triplex pump stations, all with stand-by power
- Thirteen "pocket" pump stations
- A 2.5 mile force main to convey raw wastewater from the service area to the treatment plant

Treatment Facility

The planned treatment facility will be located on approximately 38 acres of the Giacomazzi property, located 2 miles east of the community core and behind the Los Osos cemetery. The property is currently zoned agricultural. However, the soil is poor quality and is not regularly farmed. The treatment facility will be design for an average daily flow of 1.2 MGD and will consist of the following:

- Headworks and bar screens covered for odor control
- Extended aeration secondary treatment process designed to meet total nitrogen limit of 7 mg/L.
- Tertiary filter process with ultraviolet disinfection designed to meet California Title 22 standards for tertiary recycled water
- Mechanical sludge dewatering (belt filter press or screw press) enclosed in a building for odor control

Recycled Water Reuse Program

Recycled wastewater will be reused within the community or surrounding agricultural land overlying the groundwater basin. It will either be discharged through leachfields or directly reused for urban or agricultural irrigation. The reuse program will consist of the following:

- 50 acre-feet of storage at the treatment plant site
- A recycled water main running from the treatment plant site, through the adjacent agricultural area, to reuse sites within the community
- 8 acres of leachfields at the Broderson site, with an annual capacity of 450 acre-feet
- Utilize one acre of existing leachfieds in the Bayridge Estates sub-division with an annual capacity of 32 acre-feet
- Provide recycled water to Los Osos schools, parks, golf course, and cemetery
- Provide recycled water main turn-outs to adjacent farmlands and develop reuse agreements for approximately 100 to 200 acre-feet per year.

Conservation Program

The project will also implement a water conservation program with a goal of reducing indoor water consumption to 50 gallons per capita per day, which is more than a 25% reduction over current use estimates. The conservation program will be accomplished through subsidized, mandatory residential and commercial fixture retrofits, appliance rebates, education, and water efficiency audits.

Figure 1.1 Vicinity Map

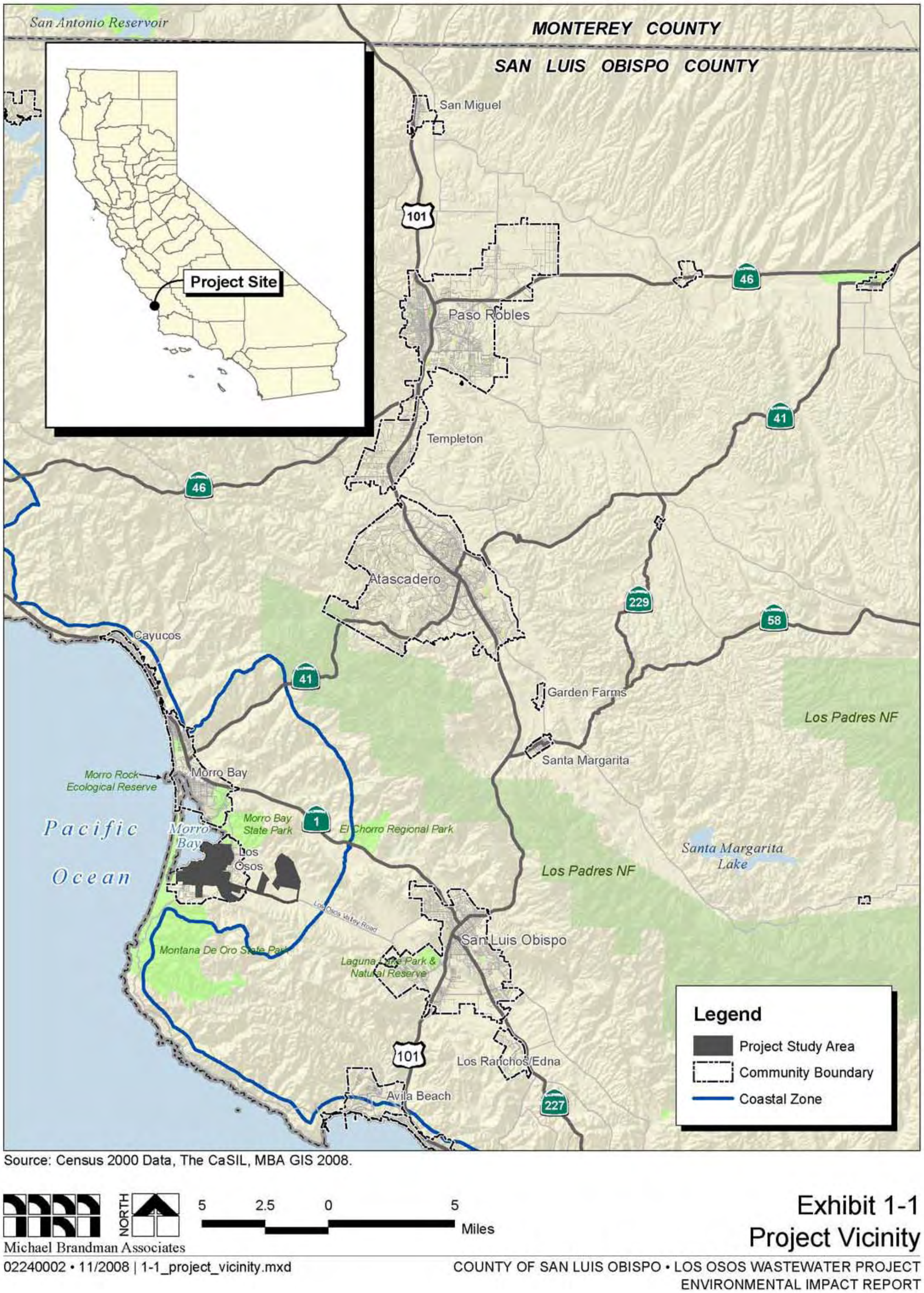


Figure 1.2 Project Setting

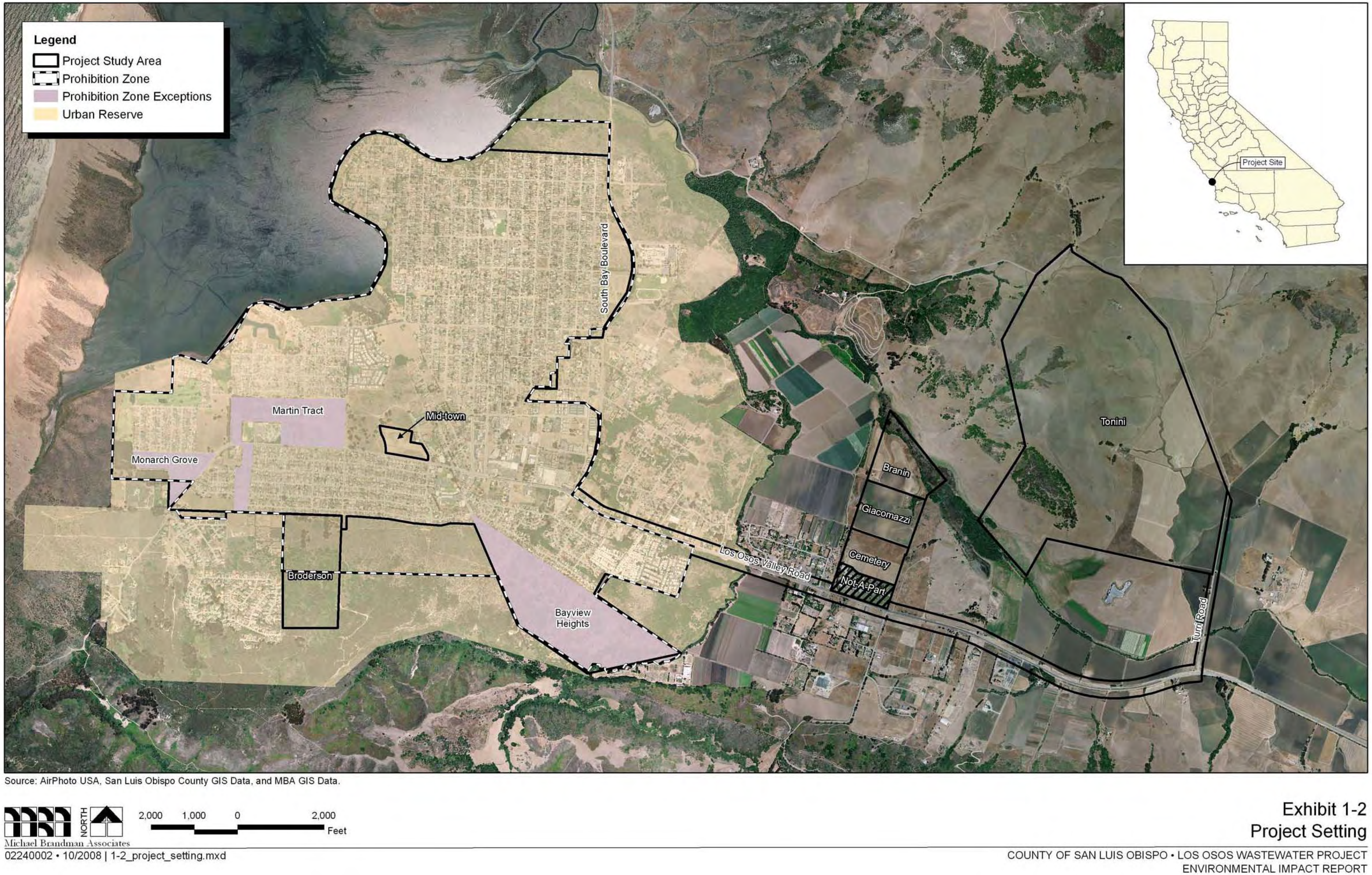
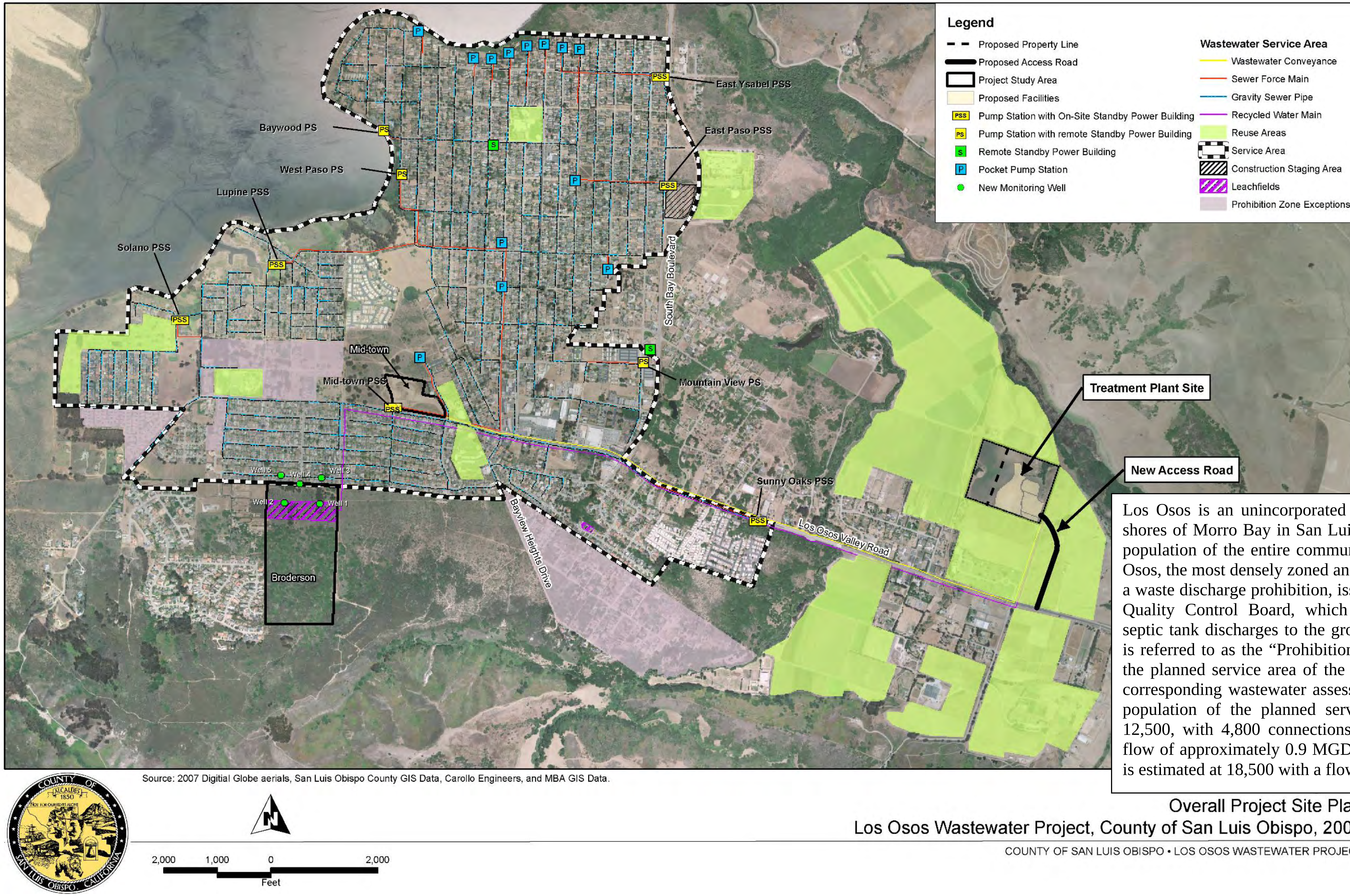


Figure 1.3 Project Diagram



Los Osos is an unincorporated community located on the shores of Morro Bay in San Luis Obispo County, Ca. The population of the entire community is 14,500. Within Los Osos, the most densely zoned and developed areas are under a waste discharge prohibition, issued by the Regional Water Quality Control Board, which requires the cessation of septic tank discharges to the groundwater basin. This area is referred to as the “Prohibition Zone.” It is the basis for the planned service area of the wastewater project and the corresponding wastewater assessment district. The current population of the planned service area is approximately 12,500, with 4,800 connections and an estimated start-up flow of approximately 0.9 MGD. The build-out population is estimated at 18,500 with a flow of 1.2 MGD.

CHAPTER 2: PROJECT PLANNING AREA

2.1. INTRODUCTION

Los Osos is an unincorporated community located on the shores of Morro Bay in San Luis Obispo County, Ca. The population of the entire community is 14,500. Within Los Osos, the most densely zoned and developed areas are under a waste discharge prohibition, issued by the Regional Water Quality Control Board, which requires the cessation of septic tank discharges to the groundwater basin. This area is referred to as the "Prohibition Zone." It is the basis for the planned service area of the wastewater project and the corresponding wastewater assessment district. The current population of the planned service area is approximately 12,500, with 4,800 connections and an estimated start-up flow of approximately 0.9 MGD. The build-out population is estimated at 18,500 with a flow of 1.2 MGD.

2.2. LOCATION

The planned project facilities will be located both inside and outside the wastewater service area. Facilities in the service area include gravity sewer collectors, force mains, pump stations, recycled water mains, and recycled water reuse and disposal systems. The wastewater treatment plant, recycled water storage, and delivery pipelines will be located approximately one to two miles east of the service area. The following figures provide an overview of the community and facilities location.

Figure 2.1 Los Osos Area Topography

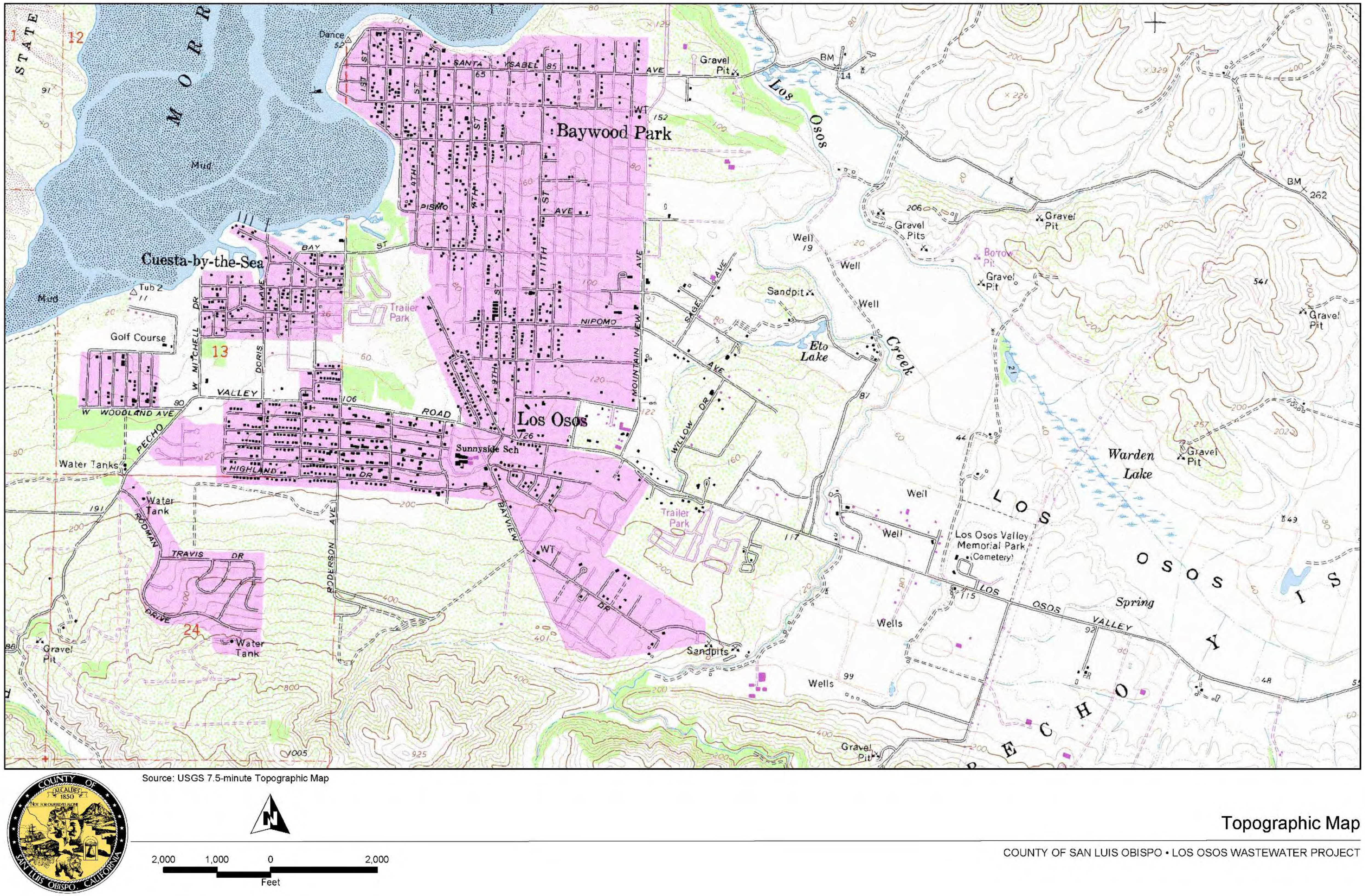


Figure 2.2 Los Osos Planning Areas

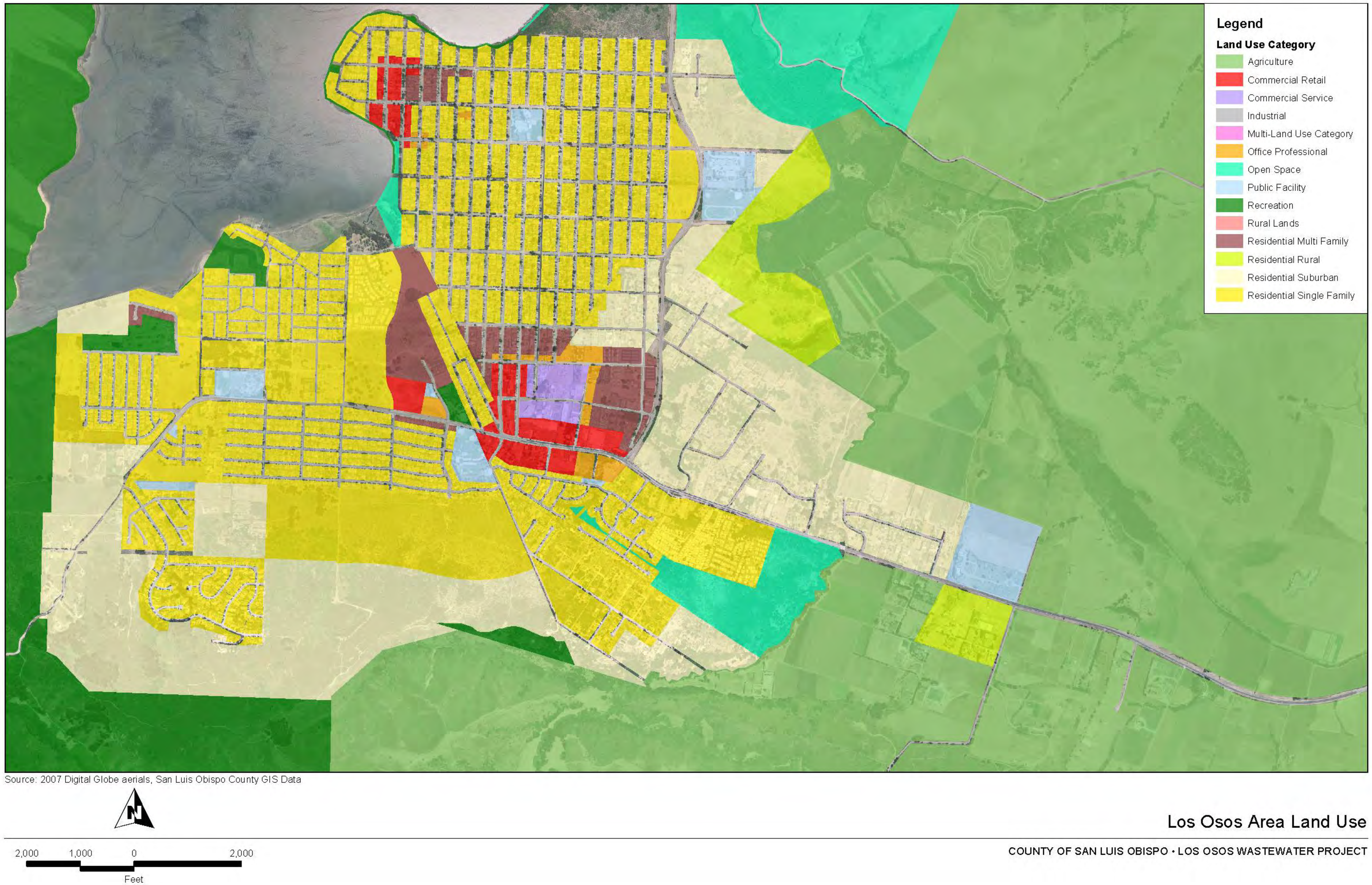
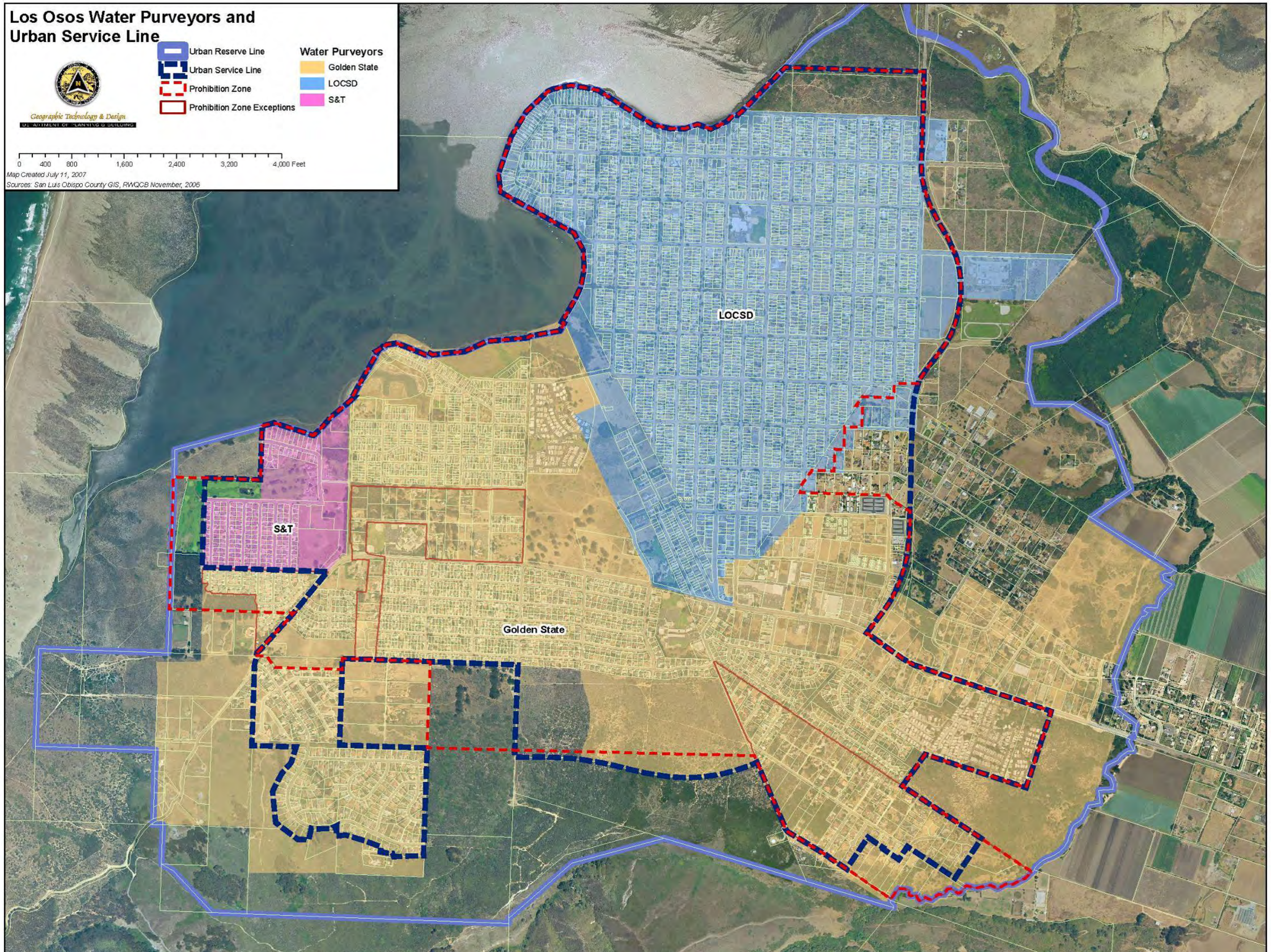


Figure 2.3 Los Osos Water Purveyors, Urban Services Line, and Prohibition Zone



2.3. ENVIRONMENTAL RESOURCES PRESENT

An EIR has been prepared for the project in accordance with the California Environmental Quality Act (CEQA) which evaluates the potential environmental impacts associated with a wastewater collection, treatment, and disposal system for the community of Los Osos. The County of San Luis Obispo, as the lead agency for the EIR, certified it on September 29, 2009. An Environmental Assessment in accordance with the National Environmental Policy Act (NEPA) has also been prepared. CEQA requires that all state and local government agencies consider the environmental consequences of projects over which they have discretionary authority before taking action. The EIR is unique in that it examines a range of alternatives on a co-equal basis in order to maximize flexibility during project selection.

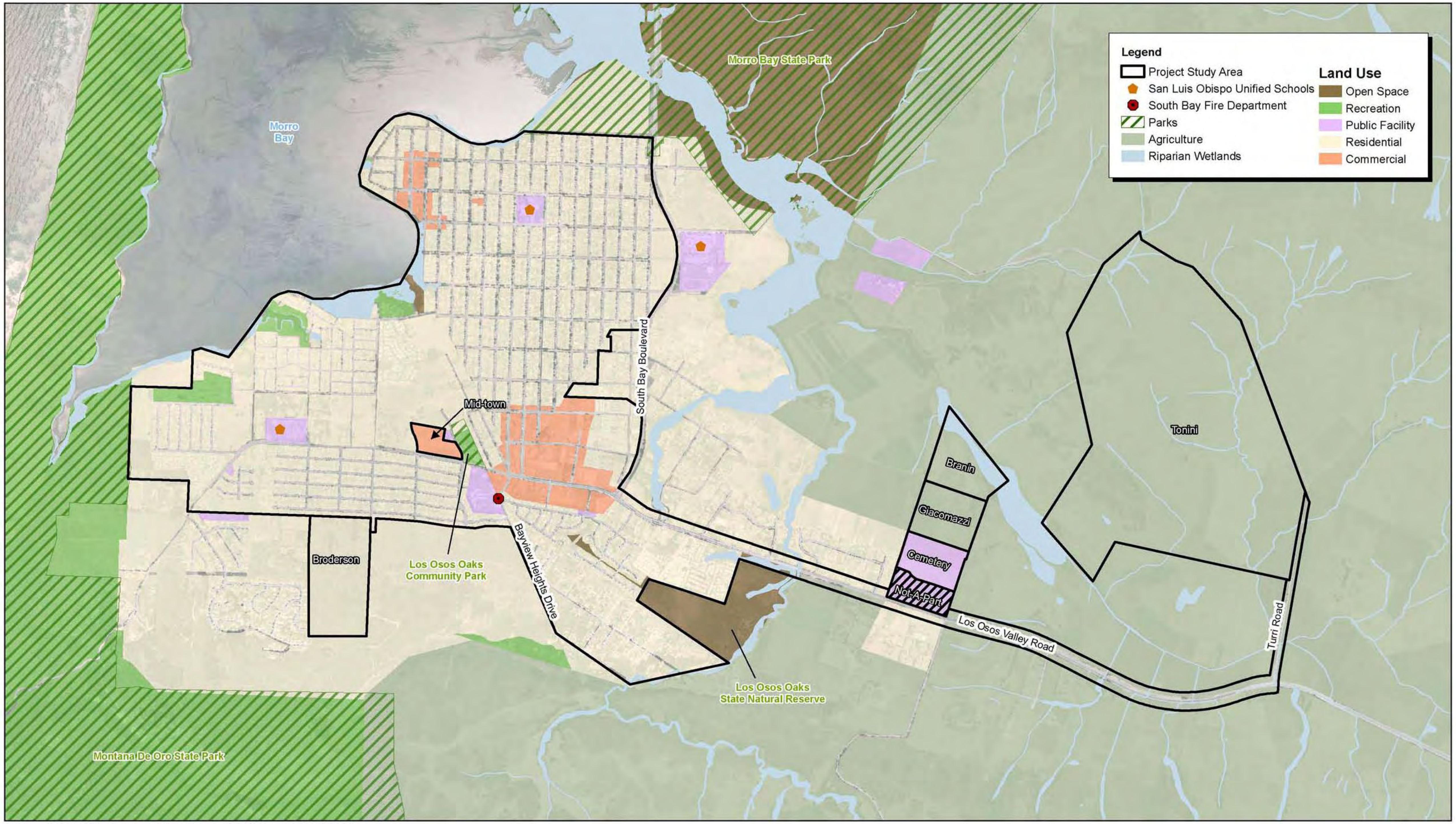
The EIR is intended to serve as an informational document for the public agency decision-makers and the public regarding the objectives, impacts, and components of the proposed project. The document addresses the potential significant adverse environmental impact that may be associated with this project, as well as identifies appropriate feasible mitigation measures and design features that may be adopted to reduce or eliminate these impacts. It identifies environmental sensitivities in the project study area, and it establishes mitigation measures and guidelines to address project-level environmental impacts that may result from specific project implementation for construction and operational consideration. The EIR evaluates the direct, indirect, and cumulative impacts of the proposed project, as well as project alternatives in accordance with the provisions set forth in CEQA and the CEQA Guidelines.

The EIR contains numerous subsections describing potential impacts of the proposed project alternatives analyzed for the project. These subsections include:

- Land Use and Planning
- Groundwater Quality and Water Supply
- Drainage and Surface Water Quality
- Geology
- Biological Resources
- Cultural Resources
- Public Health and Safety
- Traffic and Circulation
- Air Quality (and Greenhouse Gasses)
- Noise
- Agricultural Resources
- Visual Resources
- Environmental Justice

Appendix K of the EIR includes an extensive analysis of climate change impacts through the estimation and review of potential greenhouse gas emissions. The EIR concludes that in the context of overall community carbon footprint, the available collection, treatment, and disposal alternatives are relatively close from the perspective of climate change impact.

Figure 2.4 Environmental Setting



Source: AirPhoto USA, San Luis Obispo County GIS Data, and MBA GIS Data.

Michael Brandman Associates

NORTH

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Exhibit 4-1
Environmental Setting Map

COUNTY OF SAN LUIS OBISPO • LOS OSOS WASTEWATER PROJECT
ENVIRONMENTAL IMPACT REPORT

Figure 2.5 Special Status Species Habitat

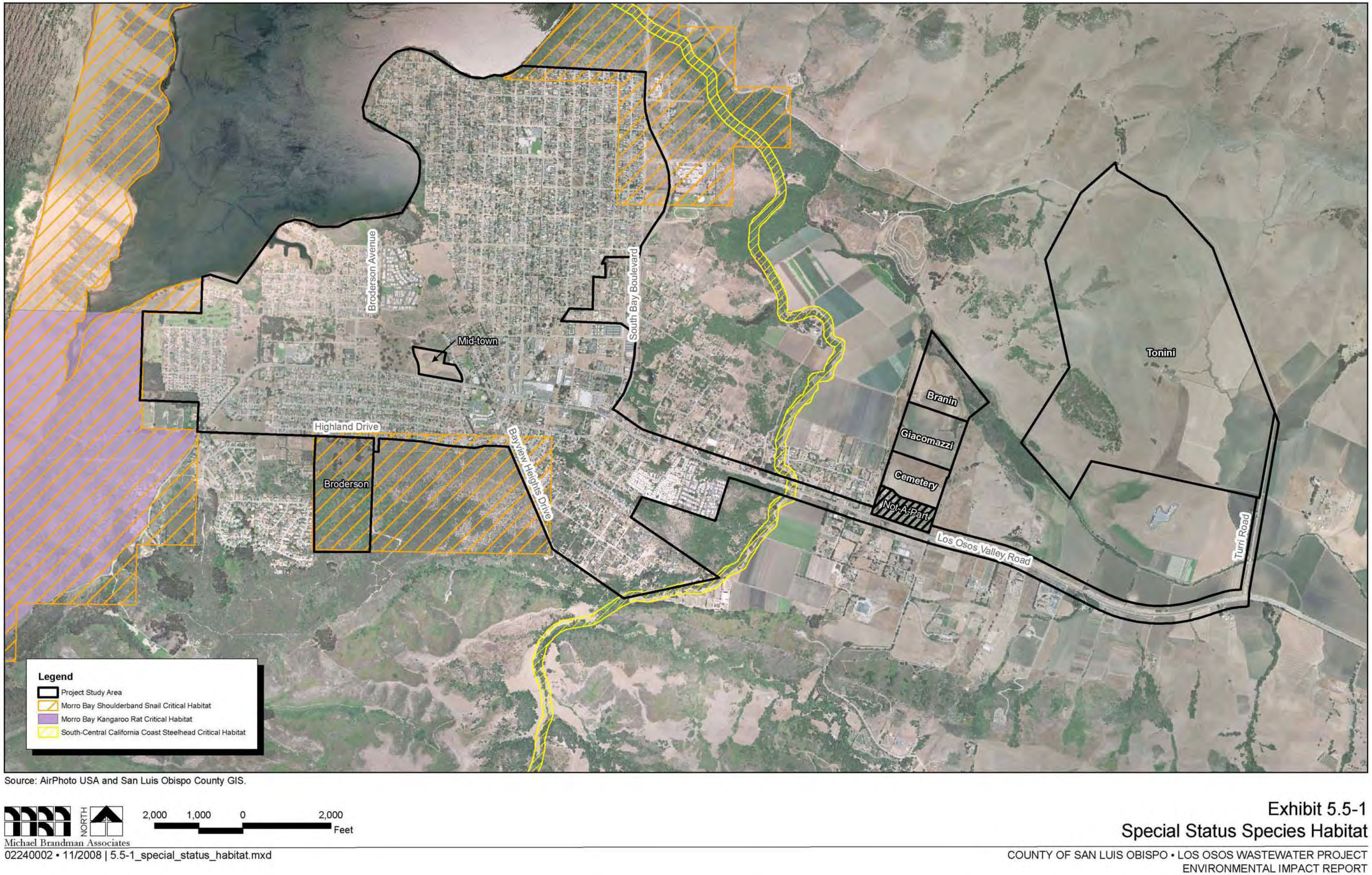

Figure 2.6 Jurisdictional Waters and Wetlands

Source: AirPhoto USA and San Luis Obispo County GIS.

Michael Brandman Associates

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Exhibit 5.5-2
Jurisdictional Waters and Wetlands

COUNTY OF SAN LUIS OBISPO • LOS OSOS WASTEWATER PROJECT
ENVIRONMENTAL IMPACT REPORT

Figure 2.7 SRA and ESHA Lands

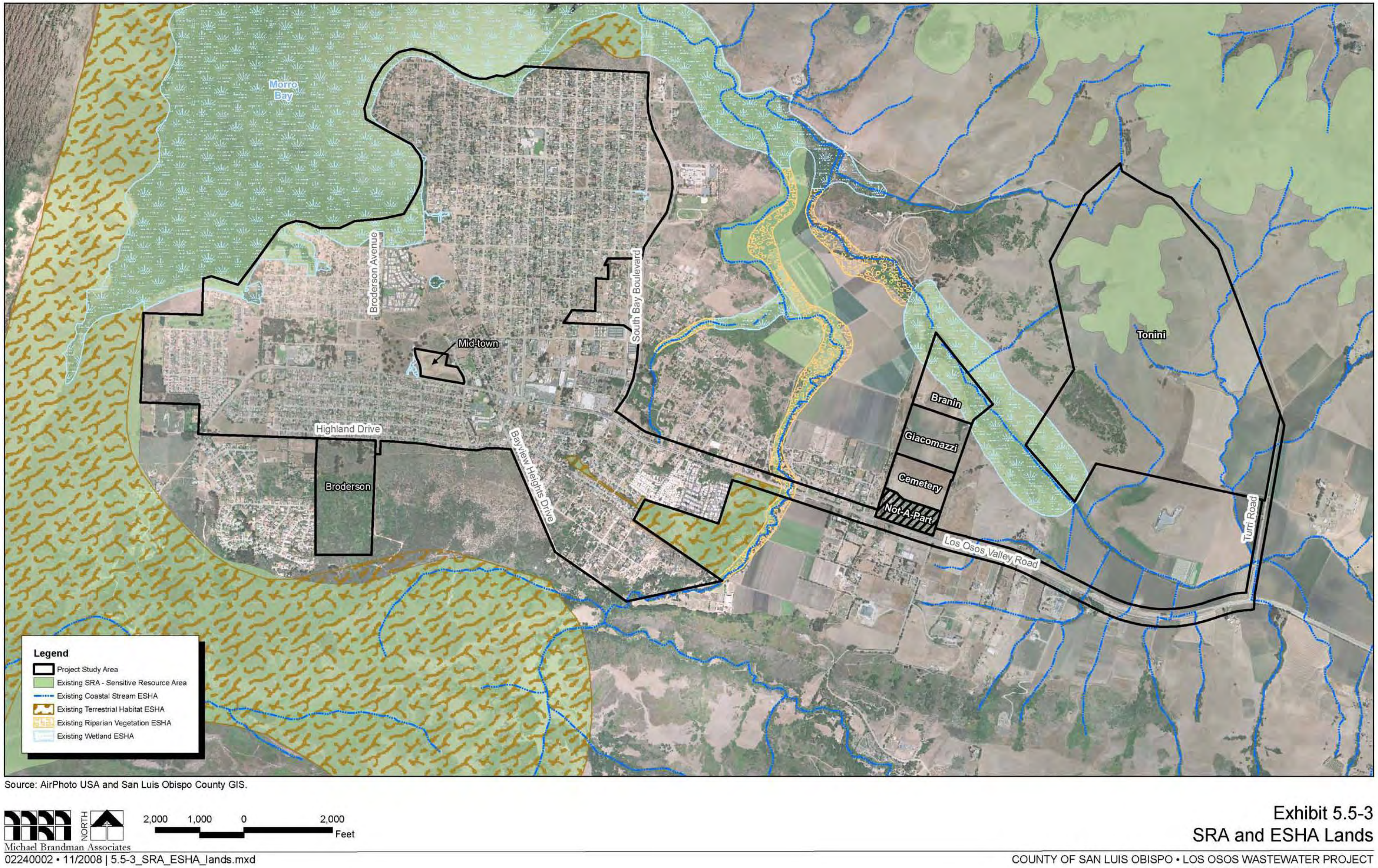


Figure 2.8 Archaeological Sensitive Areas

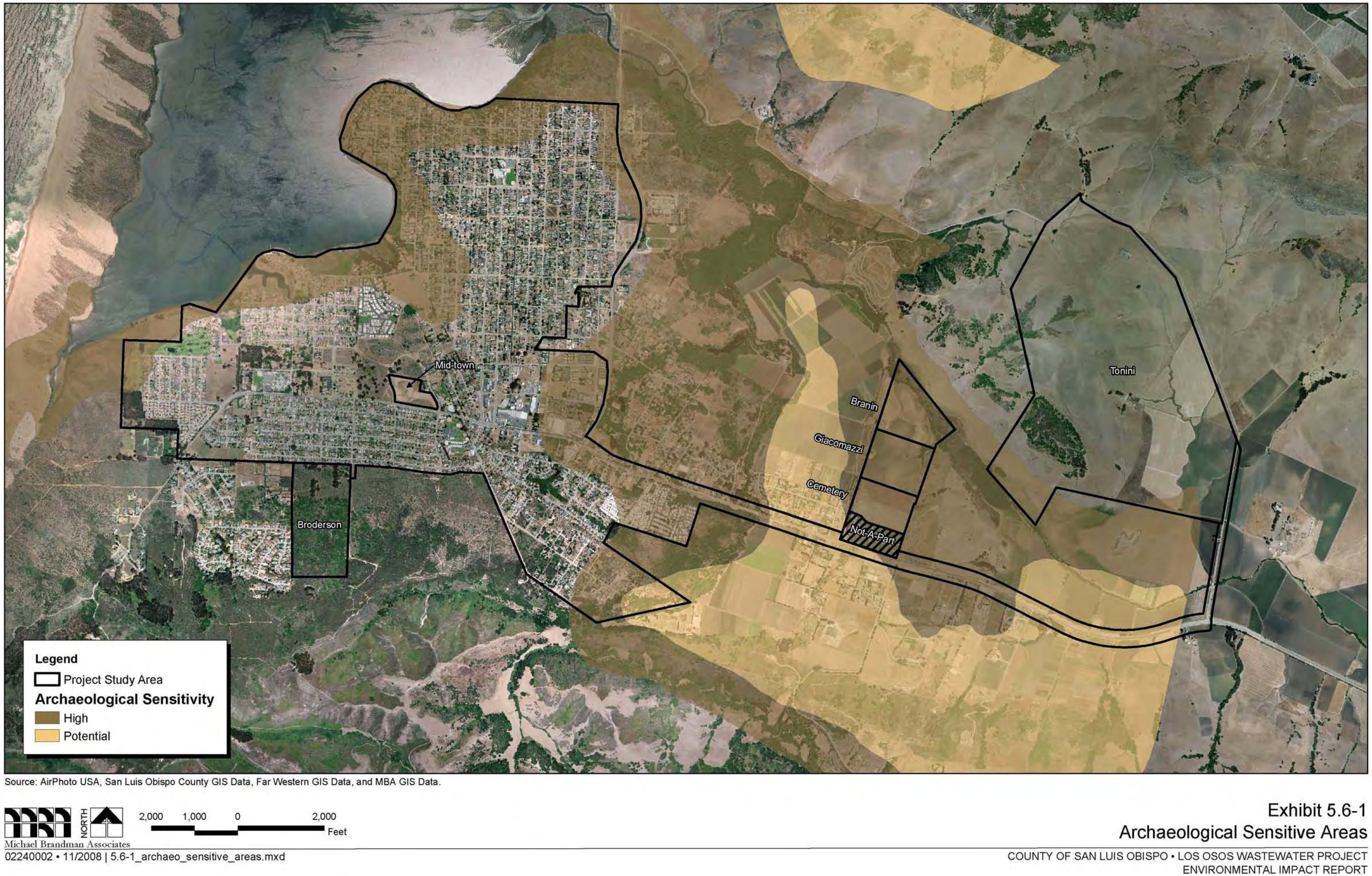
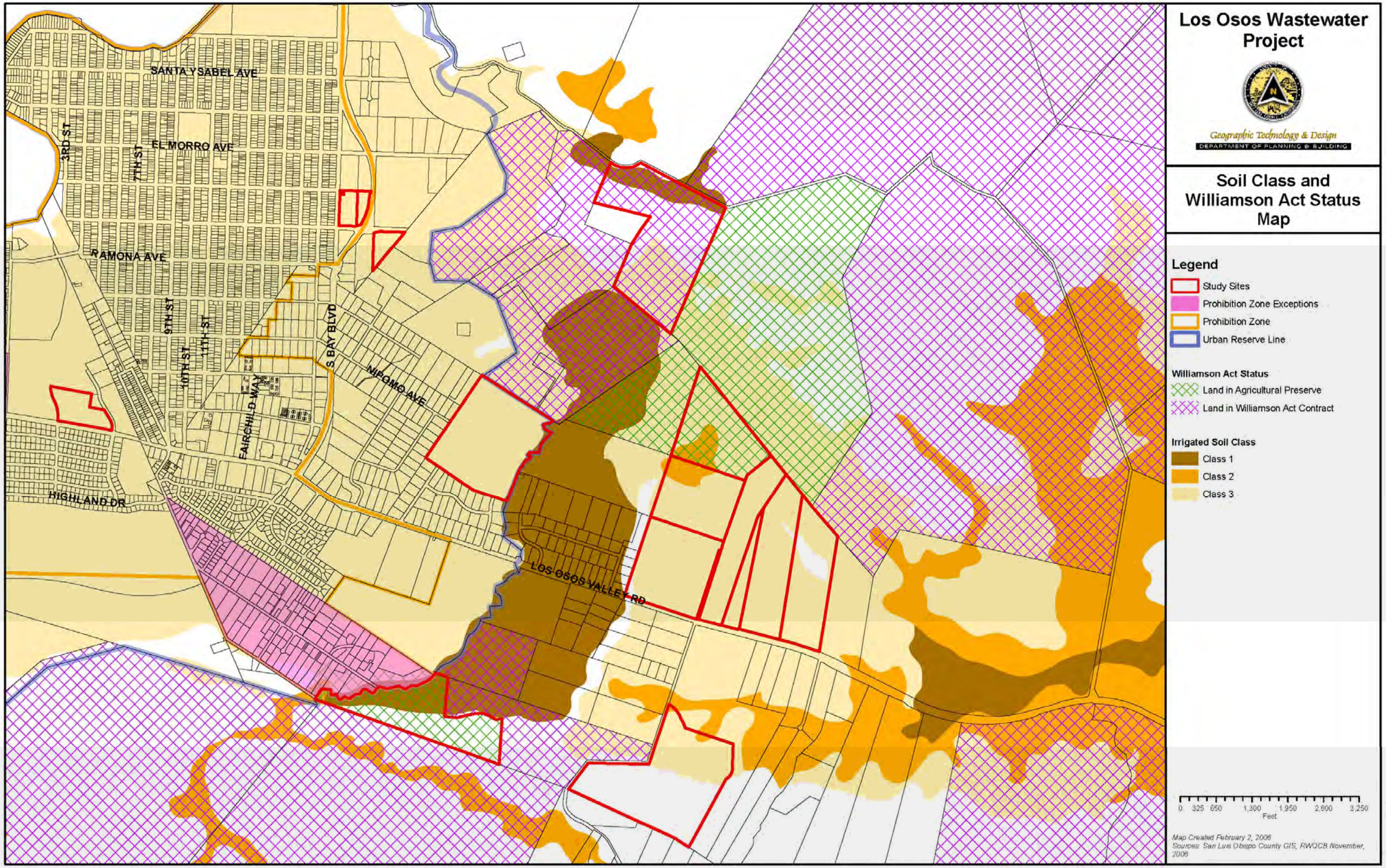


Figure 2.9 Agricultural Soils and Williamson Act Status



2.4. GROWTH AREAS AND POPULATION TRENDS

The current population of the community of Los Osos is approximately 14,200 residents, of which approximately 12,500 reside within the proposed wastewater project area. Since 1988, very little new housing has been constructed within the Prohibition Zone, and there is a backlog of construction demand in the community. The removal of the discharge moratorium within the Prohibition Zone will lead to a certain amount of new growth. However, not all of this development is expected to occur immediately. Although the discharge moratorium will be removed after completion of the project, further development in the Prohibition Zone will be subject to numerous other regulatory requirements such as compliance with Coastal Development Permit conditions which call for addressing water supply and endangered species habitat issues prior to connection to the wastewater project.

As shown in Table 2.1, the growth that has occurred within Los Osos between Year 1990 and Year 2000 includes an increase in 117 residential units, but a decrease in population of 223 people. Table 2.1 also includes an estimate of the build-out population for the community.

Table 2.1: Year 1990, Year 2000, and Build-out Population and Housing Data for Community of Los Osos

Community of Los Osos	Year 1990 [1]	Year 2000 [1]	Estimated Build-out
Population	14,377	14,154	19,713
Housing	6,094	6,214	8,284

[1] Draft Environmental Impact Report for the Los Osos Community Services District, Wastewater Facilities Project, Page 61, November 2000

The proposed project will provide a new wastewater system that will allow infill housing and population growth within the Prohibition Zone. This increase in housing and population would occur on currently vacant or underdeveloped lots scattered throughout the community. Many of these lots are currently served by roads which contain utilities within the rights-of-way that can serve additional development.

Land use and zoning in Los Osos is regulated by the County of San Luis Obispo, primarily through a General Plan document entitled the Estero Area Plan. The portions of the Estero Area Plan that impact Los Osos will be updated following the implementation of the proposed wastewater project. The current Estero Area Plan projects the ultimate population of the Los Osos community to be over 28,000 residents. However, many of the properties historically slated for development have been acquired for permanent open space and create a “green-belt” around Los Osos. More current estimates compiled by the County as part of the Estero Area Plan update process projected the build-out population at 19,713 (2004 draft). Estimates of the future population within the prohibition zone vary by source, but generally fall in the range of 17,800 (SLO County Planning) to 18,428 (Wastewater Project Team). For the purpose of the wastewater project, the more conservative build-out population of 18,428 was utilized for the collected area. See Section 4.c for discussion of growth capacity of the wastewater system.

2.5. ECONOMIC DEMOGRAPHICS

The community of Los Osos is a predominantly residential community of 14,251 residents (U.S. Census 2000) located along the central Coast of California on the southern edge of Morro Bay in San Luis Obispo County. It is combined with Baywood Park to form the Census designated place of Baywood-Los Osos. There is a small business district concentrated over just a few blocks along Los Osos Valley Road on the southeast side of the town, with several additional shops servicing the Baywood section of Los Osos. The remaining sections of town are almost entirely residential. There is no heavy or light industry within Los Osos.

Employment status for the active members of the labor force is provided in Table 2.2. In Year 1999, there were 11,538 residents aged 16 years or older; 7,250 (68%) of which were active within the labor force.

Table 2.3 provides statistical data on Year 1999 income per household within the community of Los Osos. Median household income is shown as **$46,558**. A total of 190 families and 1,205 individuals were living below the poverty level in Year 1999.

Table 2.2 Employment Status – Los Osos, CA[1]

Occupation	Number	Percent
Management, professional, and related occupations	2,660	38.4
Service Occupations	1,258	18.2
Sales and office occupations	1,657	23.9
Farming, fishing, and forestry occupations	73	1.1
Construction, extraction, and maintenance occupations	654	9.4
Production, transportation, and material moving occupations	629	9.1
Armed Forces	28	0.2
Unemployed	291	2.5
Total	**7,250**	**68**

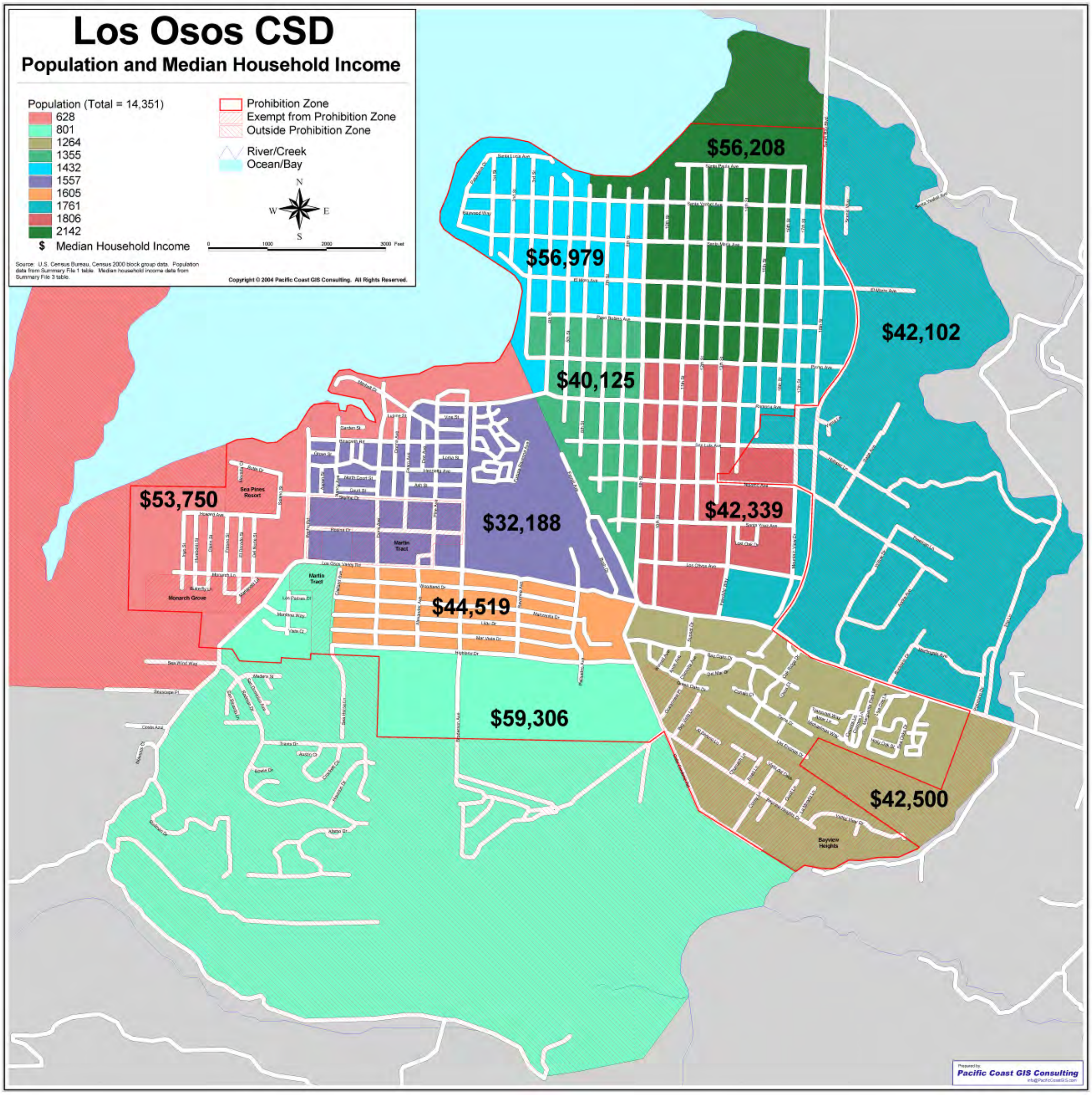
[1] U.S. Bureau of the Census, Census 2000

Table 2.3 Household Income – Los Osos, CA[1]

Income Range	Number	Percent
Households	5,908	100
Less than $10,000	296	5.0
$10,000 to $14,999	322	5.5
$15,000 to $24,999	793	13.4
$25,000 to $34,999	791	13.4
$35,000 to $49,999	914	15.5
$50,000 to $74,999	1,269	21.5
$75,000 to $99,999	792	13.4
$100,000 to $149,000	484	8.2
$150,000 to $199,999	100	1.7
$200,000 or more	147	2.5
Median Household Income	**$46,558**	**--**

[1] U.S. Bureau of the Census, Census 2000

Figure 2.10 Population and Median Household Income



CHAPTER 3: EXISTING FACILITIES

A number of small neighborhood septic systems, and one decentralized tertiary reclamation facility, currently exist in Los Osos. These facilities are described below:

- Four mobile home parks exist within the proposed collection area, each of which has neighborhood septic systems, including laterals to each unit and collector sewers within each park. The mobile home parks will be connected to the project and the septic system abandoned.

- The subdivision of Vista De Oro includes 73 single family lots that are connected to a gravity sewer system, followed by a neighborhood septic system. This subdivision will be connected to the project and the septic system abandoned.

- The subdivision of Bayridge Estates includes 147 single family lots that are connected to a gravity sewer system, followed by a neighborhood septic system. This subdivision will be connected to the project and the septic tanks abandoned. The existing leachfields will be used to discharge recycled water from the project.

- The subdivision of Monarch Grove includes 83 single family lots that are connected to a tertiary wastewater treatment facility, which is regulated under adopted wastewater discharge requirements. The Sea Pines golf resort is also served by this decentralized facility. The current project does not include a connection to Monarch Grove and Sea Pines.

In addition to the above facilities, approximately 3,000 linear feet of gravity sewer pipeline was installed in 2005 prior to the cessation of construction activities on the Los Osos Community Services District project. These installed facilities are consistent with the planned gravity sewer system contemplated in this report.

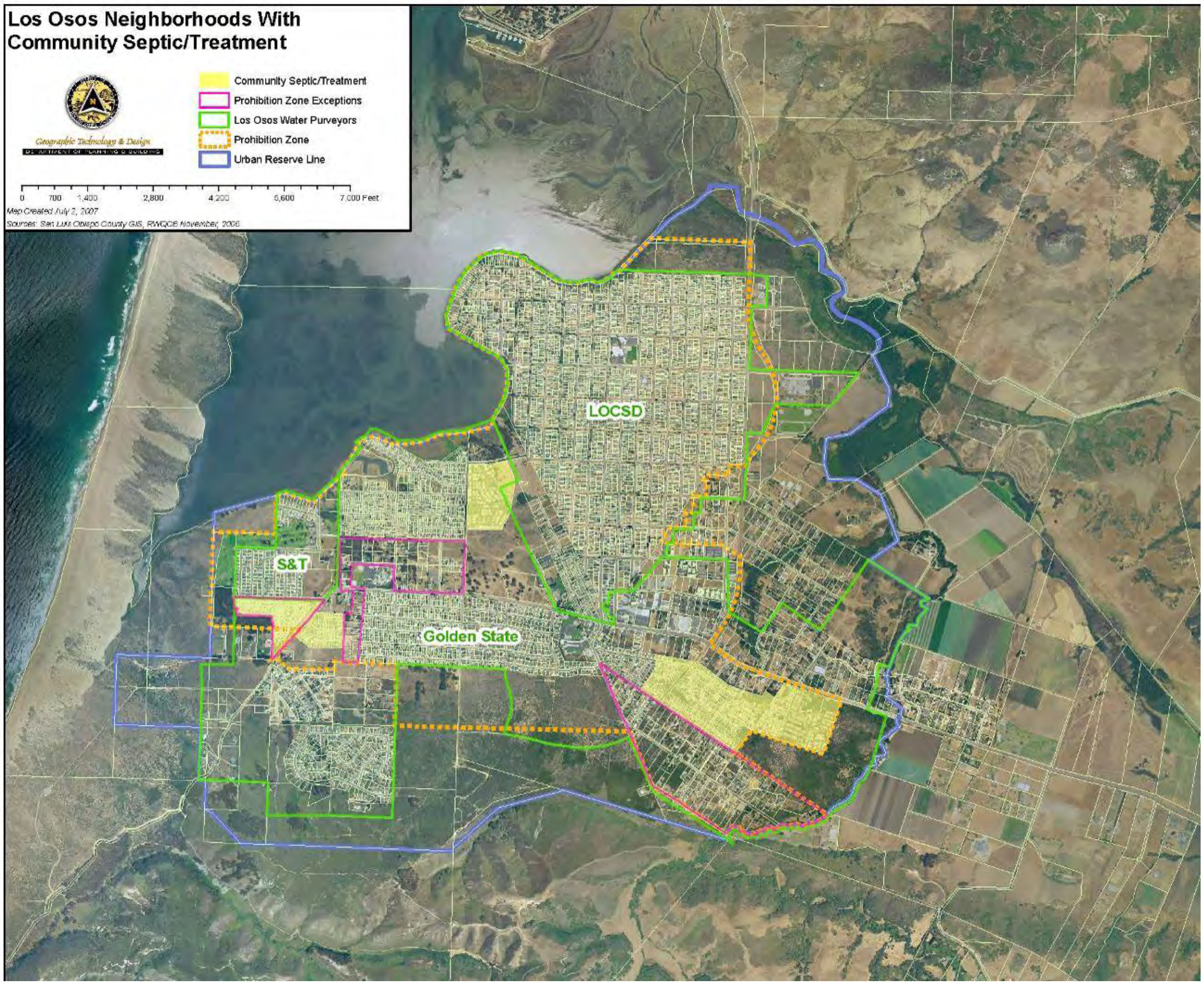
a. <u>Location Map</u>. See Figure 3-1.

b. <u>History</u>. There are no existing sewage facilities in Los Osos, beyond the few thousand feet of gravity sewer collectors. All facilities associated with this project will be new construction.

c. <u>Condition of Facilities</u>. The existing gravity sewer collectors are expected to be in acceptable condition for continued use as part of the wastewater project. However, they will be inspected during the construction phase of the project and any necessary repairs will be made prior to connection to the project.

d. <u>Financial Status of any Existing Facilities</u>. The existing facilities are owned the by Los Osos CSD and will be transferred to the County for use in the project according to the transfer provisions authorized in AB 2701.

Figure 3.1 Location of Existing Neighborhood Septic and Sewer Systems



CHAPTER 4: NEED FOR PROJECT

4.1. INTRODUCTION

Beginning as early as 1971, the RWQCB and other health agencies became concerned with the safety of the Los Osos community sanitary system. Concern arose from the high level of variance in depth to the ground water, which in certain areas is shallow enough to flood leach fields during wet weather. Additionally, many of the smaller lots do not contain sufficient land area to accommodate leach fields. As a result, these areas depend solely on deeper seepage pits which may discharge directly into the ground water. To compound matters, the Los Osos area draws its potable water supply from the groundwater. The RWQCB responded in June, 1971, by adopting an interim Basin Plan which contained a provision prohibiting septic system discharge in the area after 1974.

In 1983 the RWQCB determined that contamination in excess of State standards had occurred in the groundwater basin (upper aquifer) with a substantial effect from the use of septic systems throughout the community and followed with a regulatory mandate to cease and desist.

The RWQCB issued Resolution No. 83-13 and made the following findings:

- Previous studies (Brown and Caldwell, 1983) indicated that the quality of water derived from the shallow aquifer underlying the community was deteriorating, particularly as it relates to increasing concentrations of nitrates in excess of State standards.

- The current method of wastewater disposal by individual septic tank systems located in areas of high groundwater are a major contributing factor to this degradation of water quality.

- Continuation of this method of waste disposal could result in health hazards to the community and the continued degradation of groundwater quality is in violation of the Porter-Cologne Act.

Further, the RWQCB resolution established discharge prohibitions for a portion of the Los Osos area that became known as the Prohibition Zone. The action set a deadline for 1988, beyond which most new septic system discharges from new construction or remodels were prohibited. These regulatory actions created a moratorium, effectively halting new construction or major expansions of existing development until the water pollution problem was solved.

The need and primary purpose of the project is development of infrastructure for a wastewater collection, treatment and disposal system to serve the community of Los Osos in the designated Prohibition Zone in order to comply with the RWQCB mandate. In addition to meeting the RWQCB regulatory requirements, the project will provide a number of water quality and water supply benefits.

- The primary benefit of the LOWWP is compliance with the Regional Water Quality Control Board directives to alleviate groundwater contamination, primarily nitrates, which have occurred at least partially because of the use of septic systems throughout the community of Los Osos.

- The LOWWP provides an opportunity to begin the process of mitigating seawater intrusion, reducing nitrate contamination, and setting long term goals for achieving a sustainable water supply.

- Developing a wastewater project in Los Osos will lead to the removal of the discharge moratorium instituted by the RWQCB, returning community growth and development decisions to local officials and allowing for local control of water resources.

- Alleviating groundwater contamination will provide an additional direct benefit to the Morro Bay National Estuary and State Marine Reserve located adjacent to the Los Osos community.

- Properly implemented future measures for effluent disposal will enhance opportunities for water purveyors to improve the local water resources.

The need for the project has never been more acute than the present time. Over 25 years and approximately $50 million have been spent with no solution to the septic tank pollution. The current County efforts, authorized through unprecedented action by the state legislature, are likely the last chance for a locally led solution. The currently favorable bidding climate, availability of federal stimulus funding, and pending RWQCB fines are all factors that point to the need to implement this project within the next several months.

4.2. HEALTH, SANITATION AND SECURITY

Nitrates are the primary constituent of concern in sewage. Excessive nitrate levels can lead to health problems in humans and can cause algal blooms in surface water, which consume large quantities of dissolved oxygen resulting in adverse impacts to aquatic life. Bacteria, such as fecal coliform, and viruses are additional constituents of concern as they pose potential health risks to humans both from direct contact with contaminants in the surface water and through the consumption of shellfish.

In 1995, a study issued in by the RWQCB titled "Assessment of Nitrate Contamination in Ground Water Basins of the Central Coast Region Preliminary Working Draft," illustrated significant increases in nitrate concentrations over time in both the lower and upper aquifers. According to a letter from the RWQCB on July 10, 1998, 107 monitoring wells with more than 1,100 data points were used in the construction of the contour maps included in the study. The RWQCB letter stated:

Monitoring data indicates much of the shallow groundwater in the most densely developed areas exceeds 45mg/l, the drinking water standard for nitrate. For this reason, many of the shallow water supply wells have been removed from service and demand shifted to the deeper aquifer. Dependence upon the deeper aquifer exacerbates the surface water problems because the community's water supply, formerly from the upper aquifer, is now drawn from the deeper aquifer and recharged (after use) to the upper aquifer causing ground water levels to rise and flood more septic systems. Increasing surface water impacts including: restriction of portions of shellfish harvesting areas because of rising bacteria levels: water surround the Los Osos area periodically do not meet bacteria standards for water contact recreation (such as swimming, wading, kayaking and small boat sailing): and the public is increasingly exposed to surface wastewater.

4.3. SYSTEM OPERATIONS AND MAINTENANCE

Existing system O&M considerations are not a factor in determining the need for the project, as there are no existing sewage facilities in Los Osos, beyond the few thousand feet of gravity sewer collectors. All facilities associated with this project will be new construction.

4.4. GROWTH/BUILD-OUT FLOWS AND LOADS PROJECTIONS

Estimates of the projected wastewater flows and loads for this project were presented in the Rough Screening Report and Fine Screening Report. The Fine Screening Report recommended an I/I allowance of 0.3 million gallons per day (mgd) additional flow for the average monthly wet weather flow for a gravity system. I/I estimates for the collection system are the main source of uncertainty in calculating the future treatment facility influent volume. Updates to the I/I estimates were included in the Flows and Loads Technical Memorandum (Carollo Engineers, 2008) which resulted in a reduction of PHWWF to 2.5 mgd for a gravity system. The full text of the final Flows and Loads Technical Memorandum is included in the Appendices.

There is some uncertainty in the anticipated per capita wastewater flows in the Prohibition Zone. Wastewater from the Prohibition Zone is currently discharged onsite from septic tanks at each home. Therefore, the volume and quality cannot be directly measured. Instead, dry weather wastewater flows were estimated based on wintertime water use. This assumes that limited exterior occurs during the wintertime. According to the Flows and Loads TM and the Rough Screening Analysis, the 2006 water consumption rates for the approximately 8,500 residents served by the LOCSD were about 66 gallons per capita per day. Assuming minimal exterior water use, 66 gallons per capita per day is a reasonable current estimate of the Los Osos per capita wastewater flow. Because Los Osos is not a vacation community and because there is no seasonal industry, this figure is expected to be fairly constant throughout the year. With the estimated build-out population of 18,428, this yields a baseline dry-weather wastewater generation rate of 1.2 mgd.

As a condition of approval in the Coastal Development Permit, the project will also implement a water conservation program with a goal of reducing indoor water consumption to 50 gallons per capita per day, which is more than a 25% reduction over current use estimates. The conservation program will be accomplished through subsidized, mandatory residential and commercial fixture retrofits, appliance rebates, education, and water efficiency audits. Ongoing monitoring and public outreach programs will be adopted to ensure that the water conservation goals are maintained. Based on this conservation level, the dry weather flow value is expected to drop below 1.0 mgd at build-out. However, to be conservative, the project will be designed for the base flow rate of 1.2 mgd and assume a more moderate conservation level of 0.1 mgd.

A summary of flow estimates are presented in the table below. These are conservative flow estimates provided for treatment facility sizing. Estimates were calculated based on assumptions derived from varying literature data and previous experience with I/I as well as information specific to the current water use in Los Osos (see Final Flows and Loads Technical Memorandum, November 2008, for additional detail). Average daily flow, even during periods of sustained high groundwater, is expected to be substantially less than 120 gallons per capita per day as indicated. As a result, excessive I/I is not anticipated in accordance with SRF guideline IX.A.5. The final peak daily flow (ADWWF) for process design is assumed to be 1.4 mgd.

Table 4.1: Projected Wastewater Generation Rates

Wastewater Generation Estimate (mgd)[1]	Conservation (mgd)	$I/I_{average}$ (mgd)	ADWWF[2] (mgd)	PHWWF[3] (mgd)
1.2	0.1 - 0.3	0.3	1.4	2.5

[1] Based on Buildout Population of 18,500 people and 66 gallons per capita per day wastewater generation rate.
[2] ADWWF = Average Day Wet Weather Flow = Wastewater Generation Estimate - Conservation + $I/I_{average.}$ ADWWF serves as a basis for sizing wastewater collection and treatment facilities.
[3] PHWWF = Peak Hour Wet Weather Flow

The Rough Screening Report listed influent concentrations from a gravity collection system for the future wastewater treatment facility. These values are considered valid and will be used for treatment facilities sizing for a gravity collection system. They are shown in the table below.

Table 4.2: Gravity Collection System Wastewater Characteristics

Gravity Collection System	BOD5[1] (mg/l)	SS[1] (mg/l)	total – N[1] (mg/l)
Average Day	340	390	56
Peak Day	350	400	58

[1] BOD5 = 5 Day Biological Oxygen Demand SS = suspended solids N = Nitrogen

CHAPTER 5: ALTERNATIVES CONSIDERED

5.1. INTRODUCTION

Project alternatives have received extensive analysis in previous and current efforts to complete a wastewater project in Los Osos. The County's current efforts under AB 2701 started with a broad range of alternatives. The alternatives were narrowed through the engineering screening process with the Rough Screening and Fine Screening Reports. These reports maintained the widest possible range of alternatives, while eliminating those that were non-viable or redundant. The primary engineering and cost alternatives analysis was completed in the Fine Screening Report with in subsequent public discussions through the Technical Advisory Committee. Capital costs were developed in April, 2007 dollars (ENR Index 7879) with inflation factors and associated project soft costs included in the final calculations. A series of 12 technical memoranda were also used to evaluate various alternatives in more detail and support the EIR development. Finally, the selection of an alternative for each of the project components is a result of the environmental process and the co-equal analysis in the project EIR. The EIR analyzed several alternatives on a co-equal basis and identified the environmentally superior project. Then, through the formal decision making process at the County Planning Commission and Board of Supervisors, the environmental, economic and social factors were all considered together to reach a final approved project description.

5.2. APPROACH TO ALTERNATIVES ANALYSIS

The primary goal of the project is to construct and operate a community wastewater collection, treatment, and disposal system and thereby comply with the RWQCB's Resolution 83-13. Eliminating discharges from onsite septic systems, as directed by the RWQCB, will also help accomplish the project's second primary goal: alleviating groundwater contamination, primarily nitrate contamination that has occurred at least partially because of the use of septic systems throughout the community.

The sustainability of water resources is also an important issue because of seawater intrusion that is contaminating the lower aquifer of the Los Osos groundwater basin. While the focus of the project is to solve the wastewater problem, and thereby alleviate groundwater contamination, the wastewater project also creates opportunities for the water purveyors to improve the local water resources.

Screening Analysis

When the County assumed responsibility for the project in January, 2007, it had already embarked on an alternatives review process based on policies established by the County Board of Supervisors in June 2006. The Project Team began by preparing the "Potential Viable Project Alternatives Rough Screening Analysis Report" (Carollo Engineers, March, 2007). The Rough Screening Report focused on potential alternatives for each component of the wastewater project. The project components included the collection system, treatment technologies, treatment facility sites, effluent reuse and disposal, and solids treatment and disposal. The Rough Screening Report categorized alternatives as being infeasible or potentially viable.

The project component alternatives that passed through the rough screening analysis were screened further detail, including developing cost estimates, in the "Potential Viable Project Alternatives Fine Screening Analysis Report" (Carollo Engineers, August, 2007).

A key issue addressed in the Fine Screening Report was the relationship between the wastewater project and water supply benefits. All of the potable water for the community is obtained from its underlying groundwater basin. The basin consists, generally, of an unconfined, upper aquifer, which is contaminated with high nitrate levels at least partially because of the use of septic systems, and a confined, lower aquifer which is being impacted to seawater intrusion as a result of over pumping. The seawater intrusion has progressed to the central area of the community and required the shut-down of several production wells. On March, 27, 2007, the San Luis Obispo County Board of Supervisors certified a Level of Severity III for Los Osos, the highest water resource problem level in the County's Resource Management System (RMS).

The Fine Screening Report recognizes that the wastewater project has the ability to provide important water supply benefits and to help mitigate seawater intrusion. By replacing the existing septic tanks, the project will address the nitrate contamination and be a critical factor in increasing the supply from the upper aquifer. The effluent reuse and disposal alternatives also have the opportunity to mitigate seawater intrusion in the lower aquifer. The report analyzed and categorized project alternatives based on their respective level of seawater intrusion mitigation, while considering capital costs and the feasibility of implementation.

Three other important considerations in the Fine Screening Report were sustainability, future adaptability and project costs. Sustainability, a stated goal for the Los Osos community, is defined in the Fine Screening Report as minimizing the project's energy consumption and reusing the treated wastewater effluent as a resource to benefit the community. To the extent possible, project facility alternatives that provide flexibility to meet future regulatory requirements or provide capacity to serve the build-out population were preferred. To evaluate project costs, the engineering consultant developed conceptual-level capital and maintenance cost estimates and identified the apparent low cost alternatives.

The potential project components which passed the fine screening process, meeting the goals of the project at the lowest life-cycle costs, were combined into complete projects, known as "Viable Project Alternatives" (VPA). Each VPA was one that is considered permitable, constructible, and fundable. They included all of the project components, including collection system, wastewater treatment facility, treatment plant site, effluent reuse/disposal system, and solids processing and disposal system.

Technical Advisory Committee

In March, 2007 the San Luis Obispo County Board of Supervisors appointed fourteen local experts and laypersons to the Los Osos Wastewater Project Technical Advisory Committee (TAC). The TAC was divided into three sub-committees by the following disciplines: engineering/water resources, finance, and environmental. The TAC's first priority was to provide an evaluation of the Pros and Cons of the "Viable Project Alternatives." They began by agreeing upon five core values and the major criteria for each.

Table 5.1: Los Osos Wastewater Project Core Community Values

Core Values	Major Criteria
Affordability	• Capital and construction cost • O&M costs • Financing factors • Grant eligibility • Engineering and project management costs
Environmental Stewardship	• Environmental impacts • Potential risks due to system failure • Carbon footprint
Flexibility	• Flexibility to meet future needs and opportunities, including: expansion, future higher regulations, regional opportunities, etc. • Potential alternative energy opportunities
Sustainability	• Restoring and protecting our groundwater resources • Mitigating seawater intrusion and achieving groundwater balance in the basin • Minimizing energy use • Minimizing sludge production
Community	• Impacts on individual homeowners, residents, and businesses • Stakeholder support • Community acceptance
Controllability	• Risk of third party decisions, policies • Financial risks associated with wastewater projects • Design for maximum system control
Source: Los Osos Wastewater Project Technical Advisory Committee, San Luis Obispo County Department of Public Works, Pro/Con Analysis on Project Component Alternatives, August 2007.	

Basing their analysis of the draft Fine Screening Report, their own experience, and public comments received in writing and at the open public meetings, the TAC prepared a report entitled "Pro/Con Analysis on Project Component Alternatives" (LOWWP Technical Advisory Committee, August 2007). The TAC's detailed comments were carried forward into the screening process used to identify the project alternatives detailed in the Draft Environmental Impact Report (DEIR) prepared for the project (Michael Brandman Associates, November 2008). During 2008, a series of preliminary engineering Technical Memoranda were prepared by the County's engineering consultants to support the environmental analysis. The TAC reviewed each of these in a public forum, receiving public input, and providing formal comments.

Engineering Technical Memoranda

In early 2008, the County engineering consultant developed a series of twelve Technical Memoranda. These memoranda provided additional analysis of issues and alternatives that were identified in the screening process as need further study. They also supported the environmental analysis that was being conducted in parallel. The Technical Memoranda cover the following range of issues:

- Onsite Treatment
- Decentralized Treatment
- Low Pressure Collection System
- Flows and Loads
- Out-of-Town Conveyance
- Partially Mixed Facultative Pond Options
- Imported Water
- Solids Handling Options
- Effluent Reuse and Disposal Alternatives
- Septage Receiving Station Option
- Regional Treatment
- Greenhouse Gas Emissions Inventory

Each Technical Memorandum advanced the level of detail provided in previous documents. Draft memoranda were reviewed by the TAC and the public in community meetings, with formal comments received by the County. The environmental consultant also reviewed the draft memoranda and provided comments and questions. The final Technical Memoranda were revised in response to the comments received.

Environmental Review

The County completed a co-equal environmental review process to meet the requirements of the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). The project draft EIR was released in November, 2008, and the final EIR was adopted by the County Board of Supervisors on September 29, 2009. The environmental documents evaluate the potential impacts associated with a range of alternatives for wastewater collection, treatment, and disposal systems for Los Osos. CEQA requires that all state and local government agencies consider the environmental consequences of projects over which they have discretionary authority before taking action. The project EIR is unique under CEQA in that it examines a range of alternatives on a co-equal basis in order to maximize flexibility during project selection.

An EIR is intended to serve as an informational document for the public agency decision-makers and the public regarding the objectives, impacts, and components of the proposed project. The document addresses the potential significant adverse environmental impacts that may be associated with this project, as well as identifies appropriate feasible mitigation measures and design features that may be adopted to reduce or eliminate these impacts. It identifies environmental sensitivities in the project study area and establishes mitigation measures and guidelines to address project-level environmental impacts that may result from construction and operation of the project.

The EIR for the Los Osos project contains numerous subsections describing potential impacts of the proposed project alternatives analyzed for the project. These subsections include:

- Land Use and Planning
- Groundwater Quality and Water Supply
- Drainage and Surface Water Quality
- Geology
- Biological Resources
- Cultural Resources
- Public Health and Safety
- Traffic and Circulation
- Air Quality (and Greenhouse Gasses)
- Noise
- Agricultural Resources
- Visual Resources
- Environmental Justice

Appendix K of the EIR also includes an extensive analysis of climate change impacts through the estimation and review of potential greenhouse gas emissions. The EIR concludes that in the context of overall community carbon footprint, the available collection, treatment, and disposal alternatives are relatively close from the perspective of climate change impact.

The EIR evaluation included the direct, indirect, and cumulative impacts of the proposed project, as well as project alternatives in accordance with the provisions set forth in CEQA and the CEQA Guidelines. It provided a comprehensive environmental document that allowed the County of San Luis Obispo to approve the environmentally superior alternative. The County certified a Final EIR based on the alternatives identified through this process and made findings that support the final project decision.

5.3. ALTERNATIVES DESCRIPTION

The project alternatives in the following components: collection system, treatment technologies, effluent reuse and disposal, solids treatment and disposal, and treatment facility sites.

a. Collection System.

The Rough and Fine Screening Reports, Technical Memoranda, and project EIR reviewed of a number of collection system technologies, including conventional gravity sewers, Septic Tank Effluent Pump/Septic Tank Effluent Gravity (STEP/STEG) collection, vacuum, and low pressure grinder pump systems.

Gravity: A conventional gravity system was designed and permitted as part of the previous LOCSD Project. The system is a mostly passive central sewer system that uses gravity to move waste to the treatment facility. Based on topography, it is necessary to utilize lift stations throughout the collection system. The system transports both liquids and solids to the treatment facility.

STEP/STEG: A STEP/STEG collection system retains the use of septic tanks. The septic tanks serve to settle solids and provide a primary level of treatment. The effluent from the tanks is conveyed to an in-street collection system via pumping (STEP system) or gravity (STEG system) through small diameter pipes. The in-street collection system also has relatively small diameter pipes because the waste stream is relatively free of solids. STEP/STEG wastewater lacks dissolved oxygen (anaerobic) compared to wastewater collected by other systems, which includes a small amount of dissolved oxygen (aerobic).

Vacuum: Vacuum sewer systems use an on-site vacuum valve pit package and then a pressure differential, instead of gravity, to move wastewater to a vacuum station and on to the treatment plant. Differential air pressure is used as the motive force to transport sewage. The main lines are under a vacuum of 16 to 20-inches mercury (-0.5 to –0.7 bar) created by vacuum pumps located at the vacuum station.

The vacuum system requires a normally closed vacuum/gravity interface valve at each entry point to seal the lines so that vacuum is maintained. The interface valves, located in a valve pit, open when a predetermined amount of sewage accumulates in the collecting sump. When the valve is opened, the pressure differential between atmospheric pressure and the vacuum in the mains provides the energy required to open the vacuum interface valves, evacuate the sump contents, and propel the sewage toward the vacuum station.

Low Pressure Grinder Pump: A low pressure collection system consists of individual sumps at each customer location that collect waste and contain a grinder pump. The low pressure system is also classified as a central sewer system. The waste is conveyed from the grinder pump sumps to an in-street collection system via pumping through small diameter pipes and on to the treatment plant. The in-street collection system also has relatively small diameter pipes because the solids in the waste stream have been broken down by the grinder pumps.

Combined Gravity, Vacuum and Low Pressure Collection System: The combined system consists of gravity, vacuum, and/or low pressure collection grinder pump systems depending on the localized topography throughout the system. The combined system allows for optimization of construction and operation and maintenance costs as compared to a dedicated system. The previous designed gravity system would serve as the starting point for this alternative. Vacuum and low pressure could be incorporated in locations where topography, groundwater, or other site-specific conditions dictate, based on a value-engineering process to reduce costs.

b. Treatment Process. The Rough and Fine Screening Reports, Technical Memoranda, and project EIR reviewed of a number of wastewater treatment management alternatives and treatment processes. The management alternatives included centralized, decentralized, onsite and regional treatment. The treatment processes evaluated include extended aeration/activated sludge, attached growth fixed media, and advanced treatment ponds.

(1) Centralized Treatment. The treatment process options considered for a centralized treatment facility included a broad range of potential process, divided into the three following categories.

- Extended Aeration/Activated Sludge
  - Extended Aeration Modified Ludzak-Ettinger (MLE)
  - Membrane Bio-reactor (MBR)
  - BIOLAC® Wastewater Treatment Process
  - Sequencing Batch Reactor (SBR)
  - Oxidation Ditch
- Attached-Growth Fixed Media
  - Trickling Filters
  - Rotating Biological Contactors (RBCs)
  - Packed-Bed Filters
- Advanced Wastewater Treatment Ponds
  - Advanced Integrated Wastewater Pond System (AIWPS)®
  - Facultative Ponds with Constructed Wetlands
  - Partially Mixed Facultative Ponds (e.g., Nelson Air Diffusion System (ADS)®, Advanced Integrated Pond System (AIPS)®)

Extended Aeration/Activated Sludge. These processes remove carbonaceous pollutants and convert ammonia in the raw wastewater to nitrate. The process typically operates without primary sedimentation, using raw wastewater as its source. This system is called “extended aeration” to distinguish it from the conventional activated sludge treatment process, which is usually preceded by primary sedimentation. If necessary for the selected disposal/reuse alternative, filtration (except for the MBR system) and disinfection would be required in addition to the extended aeration/activated sludge secondary treatment process to produce Title 22 unrestricted reuse tertiary recycled water.

- Extended Aeration Modified Ludzak-Ettinger (MLE) Processes. To meet nitrogen removal objectives of 7 to 10 mg/L required for most reuse/disposal alternatives, the extended aeration process must be modified by addition of anoxic tanks and internal recycle pumping. When modified in this way, this process is called the modified Ludzack-Ettinger (MLE) process, after its inventor. Extended aeration MLE has a proven history in wastewater treatment and is capable of meeting BOD, suspended solids, and nitrogen water quality objectives. The extended aeration MLE process requires approximately 4 to 6 acres. The compact size of the system facilitates siting and minimizes land acquisition costs.

- Membrane Bio-Reactor (MBR). A membrane bio-reactor (MBR) system, was selected for the prior LOCSD Project treatment alternative due to the compact footprint. It is an activated sludge system similar to extended aeration MLE. However, polymeric membranes are used for separation of treatment organisms from the flow stream, instead of gravity sedimentation tanks. A membrane bio-reactor is used instead of secondary sedimentation tanks to remove the microorganisms from the flow stream. The membranes remove significantly more solids than sedimentation resulting in higher secondary effluent quality. Due to the high quality of the membrane effluent, only disinfection is required in addition to the MBR process to produce Title 22 unrestricted use recycled water. MBR facilities have a proven history in wastewater treatment and are capable of meeting BOD, suspended solids, nitrogen, turbidity, and coliform water quality objectives. The MBR treatment process requires approximately 4 acres, somewhat less than extended aeration MLE. The compact size of the system facilitates siting and minimizes land acquisition costs.

- BIOLAC® Wastewater Treatment System. The BIOLAC® process is a proprietary activated sludge process developed by Parkson Corporation. The BIOLAC® system is similar to the extended aeration MLE process with multiple "cells" in a large, lined earthen basin to facilitate biological treatment of the wastewater. The BIOLAC® system is typically designed for a microorganism solids residence time (SRT) of approximately 50 days compared to an SRT of approximately 6 to 15 days for the MLE process. The longer SRT reduces effluent BOD levels and provides almost complete nitrification/denitrification. Parkson Corporation claims over 500 BIOLAC® installations throughout North America treating municipal and industrial wastewater and is likely capable of meeting BOD, suspended solids and nitrogen water quality objectives. The BIOLAC® treatment process requires approximately 10 acres.

- Sequencing Batch Reactor (SBR). A sequencing batch reactor (SBR) is an activated sludge system that relies on a series of tanks. Each tank sequentially fills, aerates, settles and decants the wastewater to achieve the desired water quality objectives. SBRs have a proven history in wastewater treatment and are capable of meeting BOD, suspended solids and nitrogen water quality objectives. The SBR treatment process requires approximately 6 acres. The compact size of the system facilitates siting and minimizes land acquisition costs.

- Oxidation Ditch. An oxidation ditch system is an activated sludge system that consists of a ring or oval-shaped channel equipped with mechanical aeration devices. Oxidation ditches typically operate with long detention and solids retention times. The oxidation ditch system has a proven history in wastewater treatment and is capable of meeting BOD, suspended solids, and nitrogen water quality objectives. The oxidation ditch treatment process requires approximately 8 acres. The land requirement is greater than MLE, MBR, or SBR processes because surface aeration in the oxidation ditch process typically limits tank depth to approximately 12 feet.

Attached-Growth Fixed Media. These processes use media such as plastic or rock to support microbial growth. Wastewater is spread over the media, where the soluble organic matter is metabolized by the microorganisms and the colloidal organic matter is adsorbed on the film. Attached-growth processes require primary sedimentation tanks and would required add-on denitrification facilities to meet the expected 7 mg/L total nitrogen requirement. If necessary for the selected disposal/reuse alternative, filtration and disinfection would be required in addition to the attached-growth fixed media secondary treatment process to produce Title 22 unrestricted reuse tertiary recycled water.

- Trickling Filters. Trickling filters are an aerobic attached-growth biological treatment process that may include nitrification (the conversion of ammonia to nitrate) but are not typically employed to obtain low levels of nitrogen. If low levels of effluent nitrogen are required, typically multi-stage filters including methanol addition would be required. The trickling filter process has a proven history in wastewater treatment and is capable of meeting BOD and suspended solids, but has generally not been used to meet low levels of nitrogen. To meet secondary treatment levels for suspended solids, a supplemental contact tank is usually required. The trickling filter process requires approximately five acres. The compact size of the system facilitates siting and minimizes land acquisition costs. The tricking filter process usually includes towers 20 to 30 feet high, which can be a visual obstruction.

- Rotating Biological Contactors (RBCs). Rotating biological contactors are an aerobic attached-growth biological treatment process that may include nitrification (the conversion of ammonia to nitrate) but are not typically employed to obtain low levels of nitrogen. RBCs consist of a series of closely spaced circular disks submerged in wastewater and rotated slowly through it. As with trickling filters, clarification is required after the RBCs. RBCs have a proven history in wastewater treatment, although historically not as widely used as trickling filters, and are capable of meeting BOD and suspended solids limits. As with trickling filters, RBC systems are generally not capable of meeting low levels of nitrogen.

The RBC process requires approximately 4 to 6 acres. The compact size of the system facilitates siting and minimizes land acquisition costs.

- Packed-Bed Filters. Packed bed filters utilize hanging synthetic fibers as a fixed substrate for aerobic growth in pre-manufactured fiberglass pods with nominal dimensions of 8 feet by 16 feet. These pod-packed-bed filters are commonly used for commercial and small residential applications that utilize STEP/STEG collection. Packed-bed filters are a very new treatment process and there is little experience with long-term operation of this technology in municipal treatment plants. Most experience with the process is with small scale or on-site systems. According to the Los Osos Wastewater Management Plan Update (Ripley Pacific Company, July 2006), approximately 410 pod filters are required to accommodate a flow of 1.3 mgd at an application rate of 25 gallons per day per square foot (gpd/sf). A packed-bed filter system requires approximately 4 to 6 acres. The cost to distribute and collect process flow from this quantity of filters is likely impractical and would result in a relatively high construction costs.

Advanced Wastewater Treatment Ponds. Advanced wastewater treatment ponds is a broad term to classify large earthen or concrete basins used to stabilized domestic wastewater by natural biological processes that occur in shallow ponds. Numerous variations of treatment ponds exist to optimize suspended solids, BOD, fecal microorganisms and ammonia removal. Descriptions are provided for several types of relatively common pond systems. If necessary for the selected disposal/reuse alternative, coagulation, filtration, and disinfection would be required in addition to the advanced pond secondary treatment process to produce Title 22 unrestricted reuse tertiary recycled water.

- Advanced Integrated Wastewater Pond System (AIWPS®). The Advanced Integrated Wastewater Pond System was assessed for use in Los Osos in the Wastewater Facilities Project, Draft Project Report (Oswald Engineering Associates, January 2000). AIWPS is generally differentiated from AIPS technology by including shallow high-rate algal ponds. AIPS is similar to partially mixed facultative ponds with some adjustments. The advanced facultative and initial high rate ponds remove about 40 percent of the plant influent nitrogen by incorporation into algae. The algal mass is removed in the algal settling pond and dissolved air flotation unit. The flow is then conveyed to another set of high rate ponds where approximately 55 percent of the plant influent nitrogen is removed by another algal biomass. A second set of settling ponds and dissolved air flotation are required to remove this algal biomass. Effluent nitrogen is predicted to be approximately 8 mg/L. Filtration would be required to achieve the water quality objective of 7 mg/L total nitrogen (Oswald Engineering Associates, January 2000). Advanced Integrated Wastewater Pond Systems have a proven history of BOD and suspended solids removal, but have generally not been used to meet low levels of nitrogen. Documented nitrogen removal performance data is limited and acceptance by the RWQCB to meet the waste discharge requirements is questionable. The AIWPS® treatment process requires approximately 64 acres for the treatment ponds and emergency storage ponds as recommended by Oswald Engineering Associates, Inc. The significant area required, assuming nitrogen removal is required at some point in time, would severely limit the potential treatment plant sites.

- <u>Facultative Ponds with Constructed Wetlands</u>. Facultative organisms function with or without dissolved oxygen. Facultative ponds are generally aerobic, however, these ponds do operate in a facultative manner and have an anaerobic zone. Dissolved oxygen is supplied by algae living within the pond and atmospheric transfer through wind action. Treatment in a facultative pond is provided by settling of solids and reduction of organic oxygen demanding material by bacterial activity. Facultative ponds are usually four to eight feet in depth and can be viewed as having three layers. The top six to eighteen inches is aerobic where aerobic bacteria and algae exist in a symbiotic relationship. The aerobic layer is important in maintaining an oxidizing environment in which gases and other compounds leaving the lower anaerobic layer are oxidized. The middle two to four feet is partly aerobic and partly anaerobic, in which facultative bacteria decompose organic material. The bottom one to two feet is where accumulated solids are decomposed by anaerobic bacteria. Aerobic reactions in facultative ponds are limited because they do not have mechanical aeration. Facultative and anaerobic reactions need more time than aerobic reactions to provide the same degree of treatment. The detention time of facultative ponds is typically over 120 days. This process utilizes constructed wetlands for the final step to provide nitrogen removal.

  This system has been used at many facilities to meet BOD and suspended solids requirements for all disposal/reuse alternatives. However, the wetlands provide limited control and have water quality impacts resulting from wildlife contact. Nitrogen levels of 8 to 10 mg/L may be achieved but filtration would be required to comply with turbidity limits for reuse alternatives and achieve nitrogen levels of approximately 7 mg/L. Permitting this system would be problematic for most reuse/disposal alternatives due to the limited control and likely variations in effluent quality. The facultative ponds and constructed wetlands treatment process requires approximately 60 to 90 acres. The area required limits the potential treatment plant sites.

- <u>Partially Mixed Facultative Ponds</u>. Partially mixed facultative ponds include proprietary designs such as Nelson Air Diffusion System (ADS)®

and Advanced Integrated Pond System (AIPS)®. Specific design requirements will be considered during detailed evaluation and design, if applicable. Partially mixed facultative ponds can be viewed as a combined biological process that oxidizes organic oxygen demanding material and a physical operation that allows settling of organic and inorganic solids. Mechanical aeration provides dissolved oxygen needed for aerobic organisms in the pond to convert and oxidize the organic material in the wastewater. It also provides the physical mixing necessary to distribute dissolved oxygen, suspend the organic material and bring the organisms into contact with the organic material. Mixing must not be so great as to prevent the settling of solids for both sedimentation and for facultative and anaerobic degradation. Partially mixed facultative ponds provided with adequate aeration can be deeper and smaller than facultative ponds. Typical partial mix ponds are 10 to 16 feet deep and have a detention time of 30 to 60 days. This system has been used at many facilities to meet BOD and suspended solids requirements for all disposal/reuse alternatives. Nitrogen levels of 8 to 10 mg/L may be achieved but the system offers limited control. Filtration would be required to comply with turbidity limits for reuse alternatives and achieve nitrogen levels of approximately 7 mg/L. The partially mixed facultative pond treatment process requires approximately 20 acres. A dual power aerated lagoon would require slightly less area. The area may limit the potential treatment plant sites.

(2) Decentralized Treatment. Decentralized treatment is a wastewater management strategy that utilizes several cluster, or neighborhood, collection and treatment facilities within a larger community. They typically utilize STEP/STEG collection systems and packed bed filters, or other packaged designs, for the treatment process. This option reduces the amount and costs of pipeline for collection and effluent distribution. The County included this option in the alternatives considered and evaluated it through a series of technical memoranda. The County released a draft technical memoranda that identified issues and requirements that were specific to a decentralized treatment alternative for Los Osos. The County then retained Pio Lombardo, of Lombardo Associates, Inc., a nationally recognized expert on decentralized treatment, to develop a conceptual plan and cost estimates for Los Osos. The County then completed a final technical memorandum on the subject and incorporated it into the environmental analysis for the project EIR.

The decentralized conceptual plan developed by Pio Lombardo included seven collection and treatment zones located throughout the community. The system included a STEP/STEG collection system with a recirculating media filter followed by Nitrex denitrification filter treatment process. The denitrification filter would be necessary to meet the 7 mg/L total nitrogen requirements. Tertiary filtration and disinfection would also be provided to produce Title 22 recycled water for unrestricted reuse. The recycled water would be distributed to the individual residences for irrigation use or percolation through existing leachfields.

(3) Onsite Treatment. Onsite treatment is a wastewater management strategy that utilizes individual, onsite treatment facilities at each individual home or business. This option does not require a collection system and typically uses a package treatment process. Due to the existing pollution problem of high nitrogen levels in the groundwater, an additional denitrification process would also be required on each system. The treated effluent is used for sub-surface irrigation or discharged to a leachfield. The County included this option in the alternatives considered and evaluated it through in a technical memorandum and incorporated it into the environmental analysis for the project EIR.

(4) Regional Treatment. Regional treatment is a wastewater management strategy that combines the treatment facility for multiple communities or wastewater authorities. This option allows for cost sharing for construction and operation of the treatment facilities and may realize some economies of scale. The County included this option in the alternatives considered and evaluated it through in a technical memorandum and incorporated it into the environmental analysis for the project EIR. The other wastewater agencies considered for regional treatment are the Morro Bay/Cayucos Sanitary District and/or the California Mens Colony, a state prison. A regional treatment facility with Los Osos and one of these agencies would require a capacity of 2.4 mgd, a facility with Los Osos and both of these agencies would require a capacity of 3.7 mgd. Several alternative locations were evaluated, as well as, the pipeline routes to convey wastewater from each service area to the treatment facility. A regional treatment plant would present unique opportunities and challenges for water supply management related to the reuse of the treated effluent.

c. Effluent Reuse and Disposal.

The Rough and Fine Screening Reports, Technical Memoranda, and project EIR reviewed of a number of effluent reuse/disposal alternatives, including unrestricted urban and agricultural reuse, percolation ponds, sub-surface leachfields, sprayfields, creek discharge, constructed terminal wetlands, and direct groundwater injection.

Unrestricted Urban Reuse. Unrestricted urban reuse is the practice of using treated wastewater to irrigate landscaping in areas where public access is not restricted and requires tertiary disinfected recycled water in accordance with CA Title 22. Urban reuse would reduce pumping from the groundwater basin for potable uses, thus helping with overall groundwater management. Urban reuse was considered in Wastewater Facilities Project Final Project Report (Montgomery Watson Americas, March 2001) for irrigation of schools, parks and golf courses. The Final Project Report indicated that there are not nearly enough potential sites for water reuse in the community of Los Osos to accept all of the treated effluent. The irrigation flow for large urban water users was estimated to be 132 acre-feet/year. In terms of residential use of reclaimed water, approximately half of the water use in Los Osos is for outside irrigation, so there is significant potential for water reuse.

<u>Unrestricted Agricultural Reuse</u>. Unrestricted agricultural reuse is the practice of using treated wastewater to irrigate food crops that can be eaten raw and where the irrigation water comes in contact with the crop. This requires tertiary disinfected recycled water in accordance with CA Title 22. Agricultural reuse in areas overlying the Los Osos groundwater basin would reduce pumping from the groundwater basin and provide some benefit to overall groundwater management. The extent of the agricultural reuse depends on demand from growers. The recycled water could provide irrigation for as much as 600 to 800 acres, if up to 150 days (650 acre-feet) of seasonal storage is provided.

<u>Percolation Ponds</u>. Percolation ponds are open ponds where water is stored and percolated into the ground. The pond bottoms are managed to maintain percolation rates by drying, ripping and conditioning the soils. Site requirements for this strategy are similar to those for leachfields in that they function best with permeable soil and sufficient depth to groundwater. A percolation pond could be as large as several acres. Construction of a percolation pond involves the excavation of the pond itself and trenches for supply pipes. The area converted to a percolation pond would be permanently lost to agricultural production or habitat. Due to aesthetic issues, percolation ponds would have to be located downwind, and therefore east, of residential areas. Based on the previous WDRs developed for Los Osos, both suspended solids and BOD would be limited to a monthly average of 60 mg/L and a daily maximum of 100 mg/L. Total nitrogen would be limited to a monthly average of 7 mg/L and a daily maximum of 10 mg/L.

<u>Leachfields</u>. Leachfields are operated by subsurface spreading and percolation, so there is no open water. There are limited areas within the groundwater basin that would be appropriate for subsurface leachfields. The Broderson Site, identified as the disposal option for the LOCSD project, has a capacity of 448 acre feet per year, which is much less than the effluent flow projected for the future wastewater treatment facility. Harvest wells could be used to effectively double the site's capacity, but this route requires a separate plan for collecting, treating and disposing of the harvest water. Other potential leachfields sites in the community include the existing large septic system that serves the Bayridge Estates subdivision and disposes of approximately 33 acre feet per year. Additional potential leachfield sites could be constructed on ranch and agricultural lands east of the community in the vicinity of the potential treatment plant locations. The capacity of a disposal leachfield greatly depends on the permeability of the soil and the depth to the underlying groundwater. For example, the Broderson Site was identified as a favorable location because of the permeability of the underlying soils (mostly dune sand) and its connectivity with the shallow aquifer. By contrast, soils associated with agricultural fields generally exhibit slower percolation rates. Construction of a leachfield involves the excavation of trenches and the installation of percolation and supply pipe. Based on the previous WDRs developed for Los Osos, both suspended solids and BOD would be limited to

a monthly average of 60 mg/L and a daily maximum of 100 mg/L. Total nitrogen would be limited to a monthly average of 7 mg/L and a daily maximum of 10 mg/L.

Sprayfields. Sprayfield disposal is the practice of spraying effluent on lands to grow a crop which requires large amounts of water. Water is disposed through evapotranspiration and percolation. Care must be taken to ensure that runoff is reduced and contained. The capacity of sprayfields to accept treated wastewater would be greatest during the dry season. Spraying of fields during the rainy season would accelerate erosion and sedimentation as well as the volume of runoff conveyed by natural drainage courses. Additionally, most WDR's prohibit spraying immediately before, during, or immediately after a rainfall event. Since the capacity of the sprayfields is reduced during the rainy season, a portion of the treated wastewater would need to be stored. Under this strategy, treated wastewater would be sprayed on grazing land east of town where it would percolate into the ground or simply evaporate into the air. If the use of sprayfields is the sole disposal strategy, about 600 acres would be needed. There are several large holdings east of the community used for grazing which may be potentially suitable. The viability of this strategy depends, in part, on the ability to purchase, or negotiate contractual arrangements for the use of sufficient acreage to accommodate the desired level of disposal.

Creek Discharge. Creek discharge is the practice of disposing wastewater to a surface water body, such as a creek. Discharge to surface waters would be regulated by an NPDES permit and would have to meet the strict requirements of the California Toxics Rule for metals and organics. There are several creeks in the Los Osos area, including Los Osos Creek, which runs along the southern, eastern and northern edges of the community. Los Osos Creek empties into Morro Bay, which borders the community on its western edge. All the creeks in the Los Osos area, as well as Morro Bay, are subject to total maximum daily loads (TMDLs), since they are classified as impaired water bodies. The creeks and Morro Bay are also designated as having body contact recreation as a beneficial use, which requires Disinfected Tertiary treatment. Due to impairment and the TMDLs, nitrate (as nitrogen) would likely be limited to an average of 2.2 mg/L (Montgomery Watson Americas, Inc., 2001). Since Los Osos Creek has been issued a TMDL for sediments, pathogens, nutrients and dissolved oxygen, the treatment facility would be issued a waste load allocation for these constituents.

Constructed Terminal Wetlands. Wetlands serve an important role in improving water quality, providing flood protection and important habitat. Constructed wetlands can be used for treatment, for mitigation for destruction of wetlands elsewhere or for creation of habitat. They are also considered as a disposal method if it is necessary to release recycled water to maintain the wetland. A terminal wetland has no discharge to surface waters and is designed to evaporate and percolate wastewater effluent for disposal. This is essentially a variant of the percolation pond strategy in which the pond (or ponds) consists of newly constructed wetlands or the expansion/augmentation of existing wetlands. Wetlands have both aesthetic and biological value, in addition to possessing certain water purifying qualities. A constructed wetland could be combined with larger conservation/restoration efforts such as those undertaken by the Morro Bay National Estuary Program or other regional efforts to improve/restore water quality and biodiversity. The most suitable sites, therefore, would be those adjacent to existing wetlands where the opportunity for expansion or augmentation currently exists.

Direct Groundwater Injection. Groundwater injection is the practice of injecting wastewater into a groundwater aquifer, usually deep underground. Groundwater injection can be considered to be water reuse and is regulated by the California of Department of Health Services (DHS). Disinfected tertiary treatment is required as a minimum. However, all groundwater injection projects that have been implemented in California have been required to add membranes, such as reverse osmosis, to the treatment process. Treatment by reverse osmosis requires a disposal option for the concentrated brine that results from the process. Based on the DHS published draft regulations for planned direct and indirect recharge of groundwater, BOD will be limited to the concentration of dissolved oxygen in the effluent and total nitrogen will likely be limited to an average of 5 mg/L and a maximum of 10 mg/L. The DHS requires extensive monitoring and testing to protect public health, and there are strict guidelines for distance to nearest wells, time of travel to nearest well, depth to groundwater, percolation rate versus application rate, treatment level and water quality.

d. Solids Handling.

The Rough and Fine Screening Reports, Technical Memoranda, and project EIR reviewed of a number of biosolids treatment technologies and handling alternatives, including hauling off-site for treatment or disposal of dewatered sub-Class B (unclassified), digested Class B, or heat dried Class B and the recycling of composted Class B, composted Class A, or digested and composted Class A.

Sub-Class B Biosolids. This is the solids treatment and disposal alternative planned for the Tri-W Project. Sub-Class B biosolid production includes two unit processes: thickening followed by mechanical dewatering or solar drying. This alternative results in minimal construction of on-site treatment facilities but has relatively high disposal costs due to increased tipping fees charged by off-site facilities. Biosolids hauled to the off-site facilities receive further treatment by a contract operator prior to recycling/disposal. Sub-Class B gives the community the flexibility to add more treatment equipment in the future to upgrade to Class A or B biosolids for hauling or local recycling.

Digested Class B Biosolids. Digested Class B biosolids is similar to the previous alternative with the addition of a digestion treatment process. Digestion would occur between the thickening and dewatering operations to further stabilize the sludge and reduce the overall volume. The digestion process is assumed to produce Class B biosolids. Class B biosolids have more options for off-site recycling/disposal than

Sub-Class B biosolids, however, the capital and operating costs associated with digestion are greater than those costs associated with producing a Sub-Class B biosolids. Digested Class B gives the community the flexibility to add more treatment equipment in the future to upgrade to Class A biosolids for local recycling.

Heat Dried Class B Biosolids. Thermal drying to produce heat dried Class B biosolids uses a mechanical dryer instead of a digester. Heat drying occupies a smaller site footprint and facilitates containment of the treatment system for odor control. In the future, should the decision be made to produce Class A biosolids the Class B dryer would need significant modifications and may ultimately entail the purchase of a new dryer. Alternatively, a dryer sized to produce Class A biosolids could be purchased initially, and operated at a reduced level to make Class B biosolids. Then, should the decision be made to produce Class A, a new dryer would not have to be purchased.

Composted Class B Biosolids. Composted Class B biosolids expands upon hauling of Sub-Class B biosolids with the addition of a composting process after the dewatering process. The composting process will allow the community to produce Class B biosolids, increasing the hauling options for off-site recycling/disposal.

Composted Class A Biosolids. Composted Class A biosolids is similar to the option of composted Class B biosolids. The major differences are the time that the biosolids are required to remain in the composting facility, and the required temperature for composting. This extra time and temperature requirement necessitates only a slightly larger composting facility. The final biosolids product, however, can have been treated to the Class A level. This would allow for the greatest range of options for recycling/disposal of the biosolids including local recycling within the community. If local recycling is pursued, marketability and public acceptance of the biosolids should be investigated as part of the planning process. Additional screening of the biosolids will likely be required to remove the majority of plastics and hair that the public will likely find objectionable.

Digested/Composted Class A Biosolids. Digested/composted Class A biosolids are similar to the above recycling option except that digestion is included between the thickening and dewatering operations to further stabilize the sludge and reduce the overall volume. This alternative has the most complex operations requirements and significant capital investment. As with the above recycling option, marketability and public acceptance of the biosolids should be investigated as part of the planning process for local recycling.

e. Treatment Facility Site.

Andre 2. The Andre property is a narrow, triangular shaped parcel bordering LOVR. The site slopes gently downward to the north and contains one dwelling. Access is currently provided from the adjacent parcel in common ownership. There is one group of large trees that follows an ephemeral drainage that crosses the northerly portion of the site. The useable area of site is about 9 acres, but narrow triangular shape limits development flexibility. Access to the site is from LOVR, which is adjacent.

Branin. The Branin property is an irregularly shaped 42.2 acre parcel north of LOVR and west of Clark Valley Road. The site is adjacent to Warden Lake which consists of native wetland and riparian vegetation. The site slopes to the north and contains two ephemeral drainages. Access to the site is provided by a dirt road that wraps around the Cemetery Property and provides access to surrounding farming operations.

Cemetery Property. The Cemetery Property consists of a rectangular 47.4 parcel north of Los Osos Valley Road (LOVR) and west of Clark Valley Road. The Los Osos Mortuary and Memorial Park occupies the southerly portion of the site (about 19 acres). The site slopes gently downward to the north; the westerly boundary slopes downward to the west to a dirt road that provides access to surrounding farming operations. There are no large trees or other natural features. Access is provided from LOVR by way of a level, unimproved road bordering on the east that intersects LOVR opposite Clark Valley Road.

Giacomazzi. The Giacomazzi property is a rectangular 38.2-acre parcel north of LOVR and west of Clark Valley Road. The site slopes gently downward to the north and east toward an ephemeral drainage that extends along the easterly portion of the site to Warden Lake (offsite). The channel supports a small oak woodland along its northerly reaches adjacent to the Branin property. There is a collection of farm-related buildings along the western border with numerous tall trees surround the buildings. The level areas of the site have been plowed, but are not regularly cultivated with crops. Access to the site is provided by way of an unimproved road bordering on the east that intersects LOVR opposite Clark Valley Road.

Gorby. The Gorby property is an irregular 51.7 acre parcel south of LOVR on the east bank of Los Osos Creek. The southerly half of the parcel is steeply sloped and heavily wooded and is not suitable for building. The northern half is level and contains a residence and equestrian farm with paddocks and riding arenas. This area is Class 1 agricultural soil. The level area contains approximately 20 – 25 acres of buildable land. However, the parcel is adjacent to Los Osos Creek on its longest side and creek setbacks would significantly reduce the buildable area. Additional constraints are that the parcel is within a 100 year floodplain and is proximate to a presumed seismic fault. Access to the site is by an unimproved road across neighboring agricultural parcel from LOVR opposite Sombrero Road.

Mid-Town (aka Tri-W). The Mid-Town property is a rectangular 11 acre parcel north of LOVR and west of Palisades Avenue within the urban area of Los Osos. The parcel is owned by the LOCSD and was purchased as the treatment facility site for the LOCSD project. The parcel was graded in 2005 by the LOCSD's contractor and is gently sloping. A large amount of urban runoff passes through the site, which required a drainage basin as part of the LOCSD plans. The entire parcel is located on

Los Osos dune sands, which is designated as environmentally sensitive. The parcel is served by all urban utility services and access if from the adjacent LOVR or Palisades Avenue.

Morosin/FEA. The Morosin property is an irregular 81.2 acre parcel south of LOVR on the east side of Clark Valley Road. The southerly half of the parcel is steeply sloped and heavily wooded and is not suitable for building. The northern half is gently sloped and suitable for building. The parcel contains a church and parking area on the northeastern portion. PG&E easements for high-voltage powerlines restrict the western 400 – 500 feet of the parcel. The useable area is approximately 35 acres. Access is from the adjacent Clark Valley Road.

Robbins 1. The Robbins 1 property consists of a mostly rectangular 41.1 acre parcel abutting the north side of LOVR east of Clark Valley Road. The site contains at least one dwelling and slopes to the north toward Warden Lake. Large mature trees surround the farm buildings. The site may be used for grazing and the buildable portion of the site is about 30 acres. Access to the site is from LOVR, which is adjacent.

Robbins 2. The Robbins 2 property is a mostly rectangular 43.5 acre parcel abutting the north side of LOVR east of Clark Valley Road. The site slopes to the north toward Warden Lake. The site may be used for grazing and the buildable portion of the site is about 35 acres. Access to the site is from LOVR, which is adjacent.

Tonini. The Tonini property is an irregular 645 acre parcel on Turri Road, north of LOVR. Portions of the parcel are Class 2 agricultural soil and are used for row crops. The upland areas are used for grazing. The parcel contains a historic ranch complex with a residence, barn and other out-buildings. There are approximately 175 acres of flat to gently sloped areas suitable for building. Access to the site is from Turri Road.

5.4. EVALUATION CRITERIA

The evaluation criteria for the project components include life-cycle costs, environmental impacts, greenhouse gas emission/carbon footprint, energy use, property owner/customer impacts, future growth capacity, water quality, water conservation and reuse, and benefits/impacts to the treatment process. Extensive discussion and evaluation of the alternatives are presented in the Rough and Fine Screening Reports, selected Technical Memoranda, and the project EIR. The following is a summary of key evaluation considerations for each project component.

a. Collection System. The Rough Screening Report includes several case studies for each of the alternative collection system technologies. These case studies identified operational issues and were used to develop long-term operations and maintenance cost estimates in the Fine Screening Report. The Fine Screening Report focuses on gravity and STEP/STEG alternatives and developed detailed estimates of both capital and operations and maintenance costs. The report includes an in-depth evaluation of the issues related to retrofitting the existing properties from septic systems to a community-wide collection system. Subsequent to the rough and fine screening analysis the County conducted detailed evaluations the collection system alternatives related to key issues in several of the project technical memoranda.

The Low Pressure Collection System technical memorandum evaluated low pressure, grinder pump systems to a similar level of detail as that provided for the gravity and STEP/STEG alternatives in the Fine Screening Report. The technical memorandum includes an expanded case study of similar systems and considered on-lot impacts, construction methods, and pump performance. A detailed estimate of both capital and operations and maintenance costs was also developed.

The Flows and Loads technical memorandum provided detailed estimates of the anticipated flows to the treatment facility from both the gravity and STEP/STEG collection system alternatives. A key evaluation factor was the potential impacts of infiltration and inflow.

The Out of Town Conveyance technical memorandum evaluated potential pipeline routes and construction methods for delivering raw wastewater to treatment facility locations east of the wastewater service area. Alternative pump station locations were evaluated and an estimate of both capital and operations and maintenance costs was also developed.

The Greenhouse Gas Emissions technical memorandum estimated the greenhouse gas emission of all of the project components, including collection system alternatives. For the collection system, besides the indirect emissions resulting from electricity consumption, key emission sources were from septic tank venting and septage hauling associated with the STEP/STEG system.

The overall engineering evaluation in the rough and fine screening analysis and the technical memoranda provided detailed evaluations of many issues which may have significant impact on costs, future flexibility, operations, and maintenance. The key issues include:

- Individual property (on-lot) construction costs and impacts
- Individual property (on-lot) operation and maintenance requirements
- Operations and maintenance costs – including RWQCB monitoring and maintenance requirements
- Conveyance to out-of-town treatment facility alternatives and cost estimates
- Life cycle costs from individual properties to treatment facility
- Impacts and benefits to treatment facility associated with varying influent quality from each collection system
- Greenhouse gas emissions from each collection system
- Easement requirements

The project EIR provides additional evaluation of the collection system alternatives and is included with the project financing application. The key areas of analysis in the EIR that relate to the collection system include groundwater, biological, and cultural resources.

b. Treatment Process.

The approach to evaluating treatment process alternatives in the Rough Screening Report includes:

- Fatal Flaw Analysis - An alternative will be removed from consideration if it has a characteristic that will clearly impede its implementation, from either a cost, regulatory, institutional or technical standpoint.
- Elimination of Redundancy - An alternative will be removed from consideration if it is equivalent to the alternative that has already been developed for the LOCSD's Tri-W Project.
- Removal of Equivalent Alternatives - An alternative will be removed from consideration if there is another alternative that is clearly superior in one respect, even if they are otherwise comparable.

The Fine Screening Report focused on seven treatment alternatives and developed detailed cost estimates of both capital and operations and maintenance costs. The report includes evaluation of treatment capabilities to meet the expected nitrogen limit of 7 mg/L and upgrade to tertiary treatment. Overall, the rough and fine screening analysis include the following evaluation criteria.

- Construction cost
- Operations and maintenance costs
- Land (acreage) requirements
- Nitrogen removal capabilities
- Tertiary treatment compatibility
- Sludge production quantity and quality
- Energy consumption
- Greenhouse gas emissions
- Odor control capabilities
- Potential neighborhood impacts

In addition to the rough and fine screening analysis, the County conducted detailed evaluations of alternative treatment approaches in several of the project technical memoranda.

The Partially Mixed Facultative Pond technical memorandum evaluated facultative pond treatment processes to an additional level of detail not provided in the Fine Screening Report in order to evaluate address several key issues. The evaluation included a more detailed review of dam safety issues, nitrogen removal capabilities, algae removal, energy consumption, and a comparison between different facultative pond technologies.

The Onsite Treatment technical memorandum evaluated the potential installation of onsite treatment systems on a community-wide scale. The evaluation included a review of operational issues, the ability to dispose of, or reuse, the treated effluent, sea water intrusion mitigation, on-lot impacts, and regulatory/permitting issues. A general estimate of the capital costs per residence was also developed.

The Decentralized Treatment technical memorandum evaluated the potential for developing a decentralized wastewater collection, treatment, and disposal plan consisting of several treatment facilities located throughout the community. The evaluation included a review of operational issues, community issues, the ability to dispose of, or reuse, the treated effluent, sea water intrusion mitigation, treatment facility site constraints, and regulatory/permitting issues. A detailed estimate of both capital and operations and maintenance costs was also developed for specific decentralized alternatives in Los Osos by Lombardo Associates, Inc.

The Regional Treatment technical memorandum evaluated the potential for combining the Los Osos treatment facility with neighboring facilities at Morro Bay or the California Mens Colony. The evaluation included a review of treatment facility site constraints, pipeline routes, contractual issues, the ability to dispose of, or reuse, the treated effluent, sea water intrusion mitigation, and regulatory/permitting issues. A general estimate of both capital and operations and maintenance costs was also developed.

c. <u>Effluent Reuse and Disposal</u>.

The approach to evaluating effluent reuse and disposal alternatives in the rough and fine screening analysis had two primary criteria. The evaluation focused on the ability of each alternative to mitigate the sea water intrusion that is occurring in the community’s drinking water aquifer and achieve a balanced groundwater basin. Additionally, the evaluation considered the feasibility of each alternative to be implemented by the County, acting as the wastewater authority, or whether other partners were required that were beyond the control of the County or beyond the scope of a wastewater project. Detailed estimates of both capital and operations and maintenance costs were also developed.

In addition to the rough and fine screening analysis the County provided further detailed evaluation in the Effluent Reuse and Disposal technical memorandum. The technical memorandum provided further details for the most viable alternatives and evaluated various scenarios of combined alternatives. The overall evaluation of reuse and disposal alternatives included the following considerations.

- Mitigation of sea water intrusion.
- Feasibility within the scope of the wastewater project

- Construction cost
- Operations and maintenance costs
- Water quality objectives required for each alternative, including treatment level, suspended solids limits, BOD limits, and total nitrogen limits.
- Salt and mineral loading.
- Total capacity of each alternative relative to total wastewater flows.
- Winter and operational storage requirements.
- Flexibility for future growth within build-out projects of the General Plan.
- Land requirements.
- Regulatory/permitting requirements.
- Dam safety issues.
- Seasonal demand or capacity.
- Ability to phase development and avoid stranded costs

d. Solids Handling.

The Rough Screening Report recognizes the uncertainty of the direction of the biosolids disposal regulations at the state and local levels and establishes the primary criteria that the solids handling facilities be designed in a manner that allows for the greatest treatment and disposal flexibility. At the same time, this flexibility must be sensitive of environmental constraints, community values, footprint availability, energy usage, continued operations and maintenance requirements, and capital cost. It includes the following assumptions for evaluating solids handling alternatives.

- Class A biosolids production should include composting. Other options for long-term Class A production and management would pose a significant acceptance risk.
- Due to a local ordinance, non-composted Class A biosolids must either be hauled off-site or land applied at a regional location. The transportation costs and tipping fees do not favor hauling Class A over that of Class B. Therefore, there is no perceived benefit to the production of non-composted Class A biosolids.
- Alkaline stabilization will not be pursued due to the likely difficulties associated with regulatory approval and mitigation requirements while limiting the biosolids market.

The Fine Screening Report evaluated the solids handling alternatives in greater detail, taking into consideration the impacts of the collection system and treatment process alternatives. Detailed estimates of both capital and operations and maintenance costs were also developed.

In addition to the rough and fine screening analysis the County provided further detailed evaluation in the two technical memoranda. The Solids Handling technical memorandum provided further details for the most viable alternatives including end use options, co-generation potential, solar greenhouse drying, and composting. The

Septage Receiving Station technical memorandum considered the potential impacts and benefits of collection and treatment of additional solids by establishing a regional septage receiving center. The evaluation concluded that a regional septage receiving station would not be cost effective in Los Osos. The overall evaluation of solids handling alternatives included the following considerations.

- Future flexibility
- Capital costs
- Operations and maintenance costs
- Federal, state and local regulations and permitting requirements
- Land requirements
- Co-generation options
- Regional septage receiving options
- Local land disposal constraints
- Storage requirements

e. Treatment Facility Site. The evaluation criteria for potential treatment facility sites are presented in the following table, taken from the Rough Screening Report, and are a summary of the issues considered in rough and fine screening analysis.

Table 5.2 Treatment Facility Site Requirements and Issues

Siting Requirements	Issues
Acreage and Topography	• Must be of sufficient size and level topography to accommodate all of the facilities associated with a particular treatment technology. • More land intensive technologies have a higher potential to adversely affect sensitive biological, archaeological and/or agricultural resources.
Flood Hazard	• A suitable site for a wastewater treatment plant must avoid, or be protected from, the potential affects of flooding. • A treatment plant location should not contribute to downstream flooding or worsen an existing drainage problem. • Areas near Los Osos Creek and its tributaries are subject to flooding during major storm events (See Section 5.3.2).
Access to Infrastructure	• A suitable site must be accessible to supporting infrastructure – Roadways of sufficient size and capacity to accommodate the types of service vehicles and level of traffic anticipated. – A stable source of water and electricity.

Table 5.2 Treatment Facility Site Requirements and Issues

Siting Requirements	Issues
Sensitive Resources	
Agricultural Land	• Farmland suitability classifications for the properties as mapped by the California Department of Conservation (See Section 5.3.2). • The California Land Conservation Act (California Government Code Section 51290 et seq.) encourages the conservation of agricultural lands by providing a tax incentive to land owners who contract with the County to restrict land uses to agriculture and compatible uses. – Properties subject to an LCA contract must remain in agricultural use for the duration of the contract, a minimum of ten years. – A property owner may cancel the contract by filing a Notice of Non-renewal and the contract is terminated at the end of ten years. – The law provides for the cancellation of a contract but only under special circumstances and only after the Board of Supervisors makes certain specific findings. – The Gorby and Branin properties are subject to an Agricultural Preserve, making them eligible for an LCA contract.
Biological Resources	• The Los Osos area provides habitat for a number of special status species, as well as other sensitive biological resources that include riparian corridors (Los Osos Creek) and wetlands. Special-status species are plants and animals that are either listed as ‘endangered’ or ‘threatened’ under the Federal or California Endangered Species Acts, listed as ‘rare’ under the California Native Plant Protection Act, or considered to be rare (but not formally listed) by resource agencies, professional organizations, and the scientific community. • The area contains Environmentally Sensitive Habitat Areas (ESHA), which are subject to additional protections prescribed by the California Coastal Act.
Archaeological Resources	• Over 60 archaeological sites have been identified among the stabilized dunes of Los Osos and extending to the east along both sides of Los Osos Creek and beyond. • The potential to un-earth previously undiscovered archaeological resources should be considered high, especially for sites near Los Osos Creek.
Hydro-Geology, Soils and Geological Hazards	• Geologic constraints that could affect the suitability of a site for treatment facilities include: – The presence of an active fault trace. – The presence of unstable or expansive soils. – Shallow groundwater. – Slope instability. • The Paso Robles Formation comprises the plateau and gently rolling hill area east of the alluvial deposits adjacent to Los Osos Creek where the majority of potential sites are located. Sediments of the Paso Robles Formation are generally equivalent to stiff to hard cohesive soils and medium dense to very dense granular soils that are less suitable for farming but are suitable for building sites (See Section 5.3.2). • The Los Osos fault is considered ‘active’ and a portion of the fault zone near the intersection of Los Osos Valley Road and Foothill Boulevard, about 7 miles to the southeast, lies within a Seismic Special Study Zone as prescribed by the State of California Alquist-Priolo Special Studies Zones Act. The potential exists for fault rupture to affect sites in the vicinity.
Visual Resources	• The placement of treatment facilities along these corridors will need to include architectural and landscape mitigation to prevent adversely impacting scenic resources.

Table 5.2 Treatment Facility Site Requirements and Issues

Siting Requirements	Issues
Proximity of Sensitive Receptors	• The design of a treatment plant must consider the management of odors and impacts to surrounding sensitive receptors, which include residential neighborhoods, farms and ranches, businesses, and public/quasi-public facilities (schools, churches, etc.).
Regulatory Issues	• Land use within the unincorporated County is governed by the San Luis Obispo County General Plan and Land Use Ordinance. • An Agriculture and Open Space Element has been adapted by the County to guide the protection of significant agricultural resources. • The community of Los Osos and the area inland of Los Osos Creek fall within the Coastal Zone as defined by the California Coastal Act of 1976. Provisions of the Coastal Act are aimed at protecting important coastal resources and 'environmentally sensitive habitat areas'. Policies of the Coastal Act establish fairly precise criteria to govern the location and design of a 'wastewater treatment works' within the Coastal Zone. • The federal Clean Water Act establishes standards for water quality as well as governing activities that may impact 'waters of the United States', such as perennial streams and estuaries. • And lastly, the Los Osos area is known to support habitat for a number of species listed in accordance with the California and federal Endangered Species Acts. These laws address direct and indirect impacts to special status plant and animal species and set forth a process through which these species are to be protected from land development activities.
Proximity to Collection Service Area and Disposal Sites	• The more distant the treatment plant is from the collection area, the greater is the potential for construction and operational impacts associated with the collection main that conveys wastewater to the plant.
Other Site-Specific Factors	• Other factors to be considered include (but are not limited to) easements or other private restrictions on the title of a given site.

5.5. MAPS

Figure 5.1 shows the location of potential collection system pipelines within the community for any alternative and the pump station locations that would be required with a gravity system.

Figure 5.2 shows the alternative treatment facility sites that were considered in the engineering and environmental analysis. [DEIR Ex. 7-1 or FSR (sites)]

Figure 5.3 shows several potential pipeline routes for conveyance of raw wastewater to a treatment facility east of the community. Further information is available in the Out of Town Conveyance Technical Memorandum included in the Appendices. [DEIR Ex. 7-2 or TM (conveyance routes)]

Figure 5.4 shows the viable effluent reuse and disposal alternatives for the project. [DEIR Ex. 7-3 or FSR/TM (reuse/disposal options)]

Figure 5.1 Project Diagram

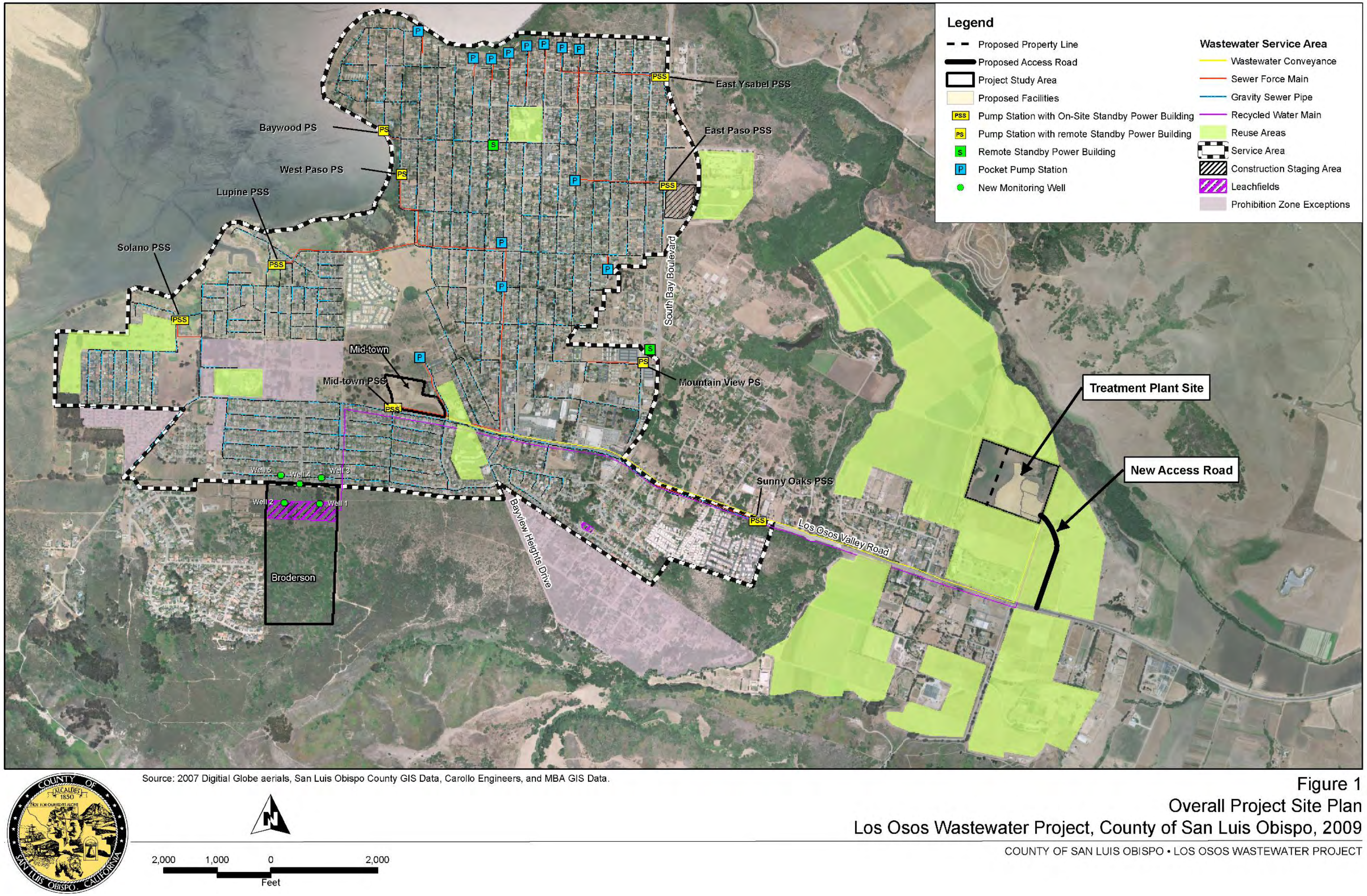
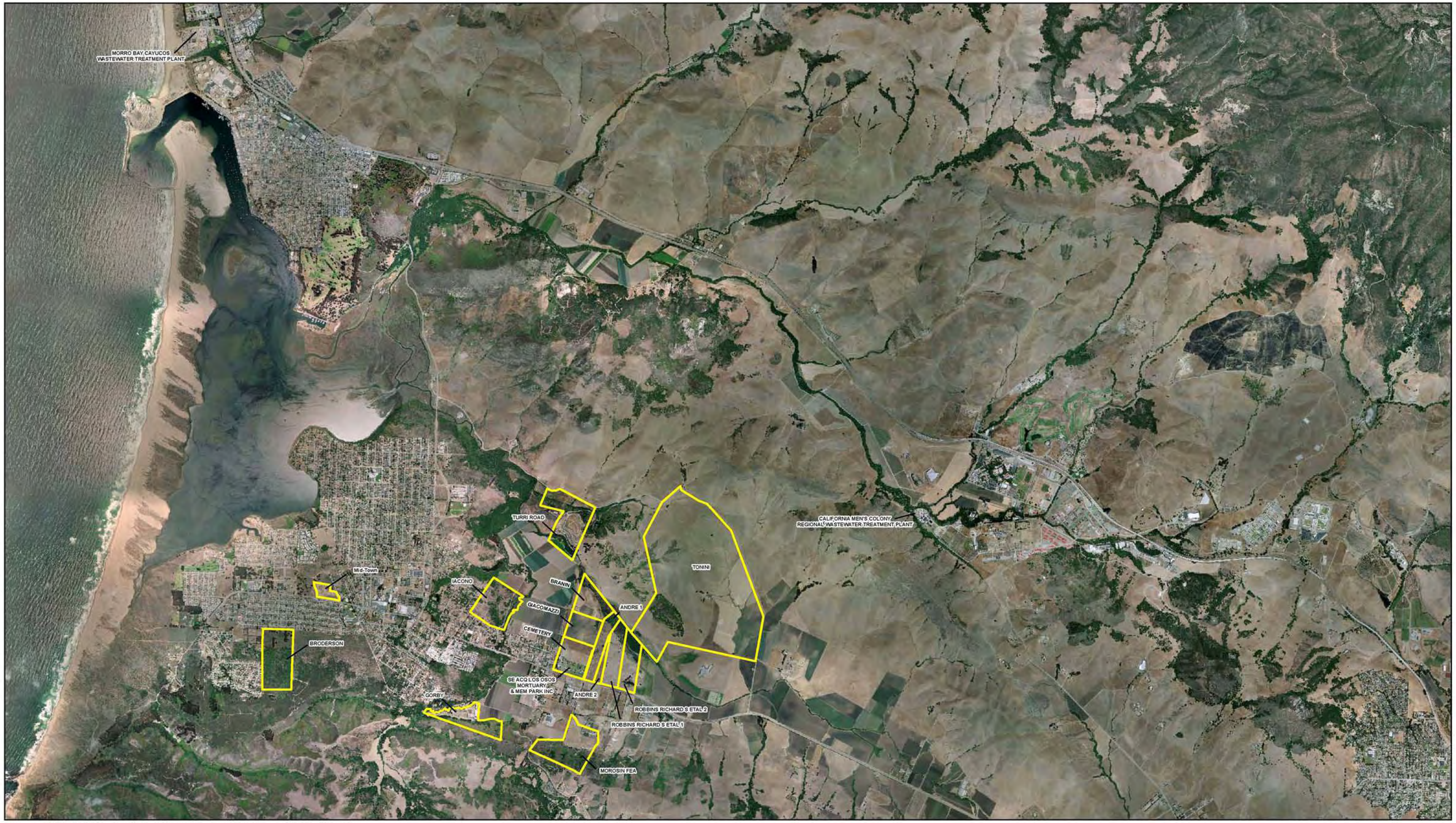


Figure 1
Overall Project Site Plan
Los Osos Wastewater Project, County of San Luis Obispo, 2009

COUNTY OF SAN LUIS OBISPO • LOS OSOS WASTEWATER PROJECT

Figure 5.2 Treatment Plant Site Alternatives



Source: AirPhoto USA, San Luis Obispo County GIS Data, and MBA GIS Data.

Michael Brandman Associates

NORTH

4,000 2,000 0 4,000
Feet

02240002 • 11/2008 | 7-1_treatment_plant_site_alt.mxd

Exhibit 7-1
Wastewater Treatment Plant Site Alternatives

COUNTY OF SAN LUIS OBISPO • LOS OSOS WASTEWATER PROJECT
ENVIRONMENTAL IMPACT REPORT

Figure 5.3 Out-of-Town Conveyance Route Alternatives

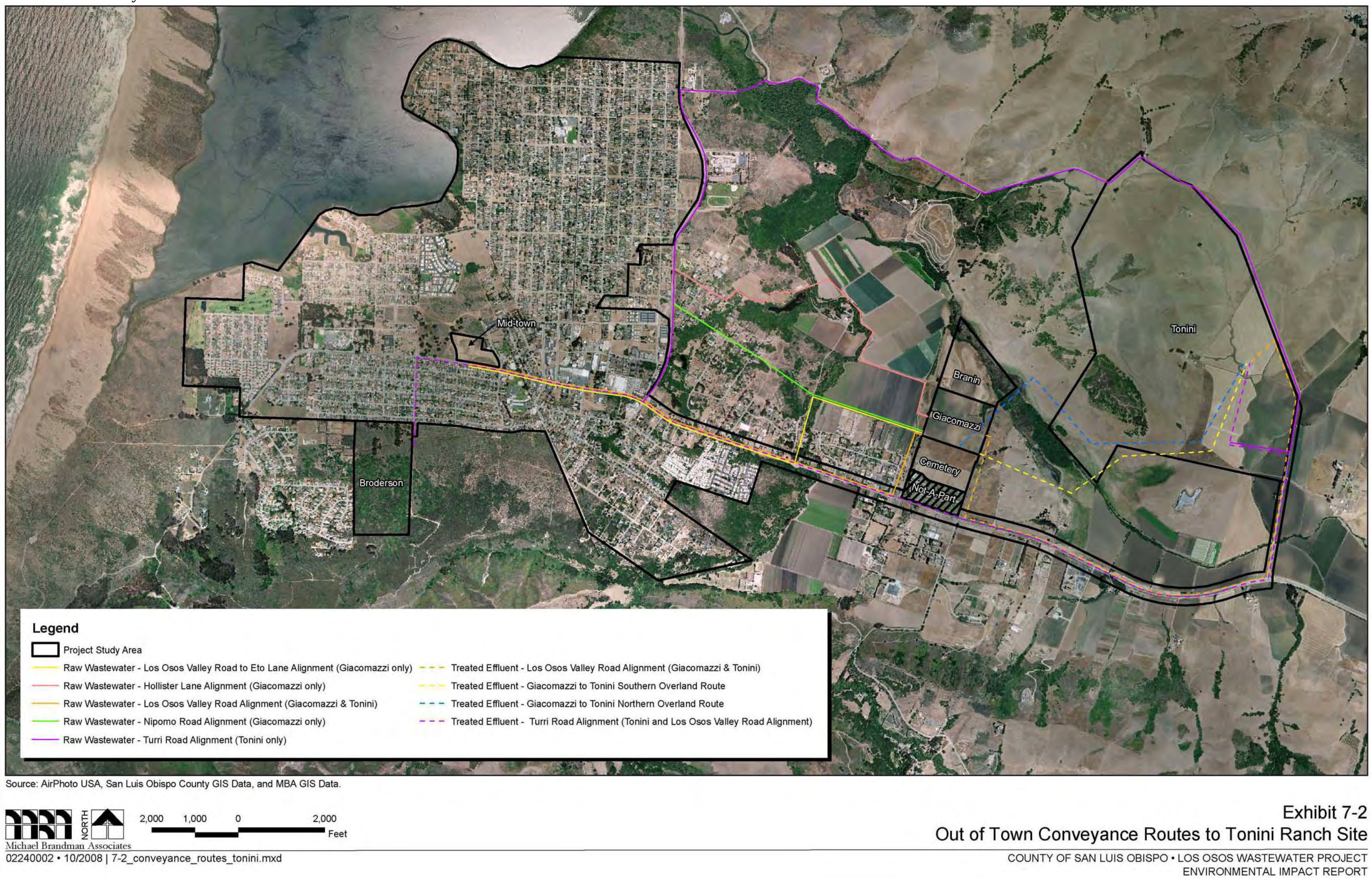
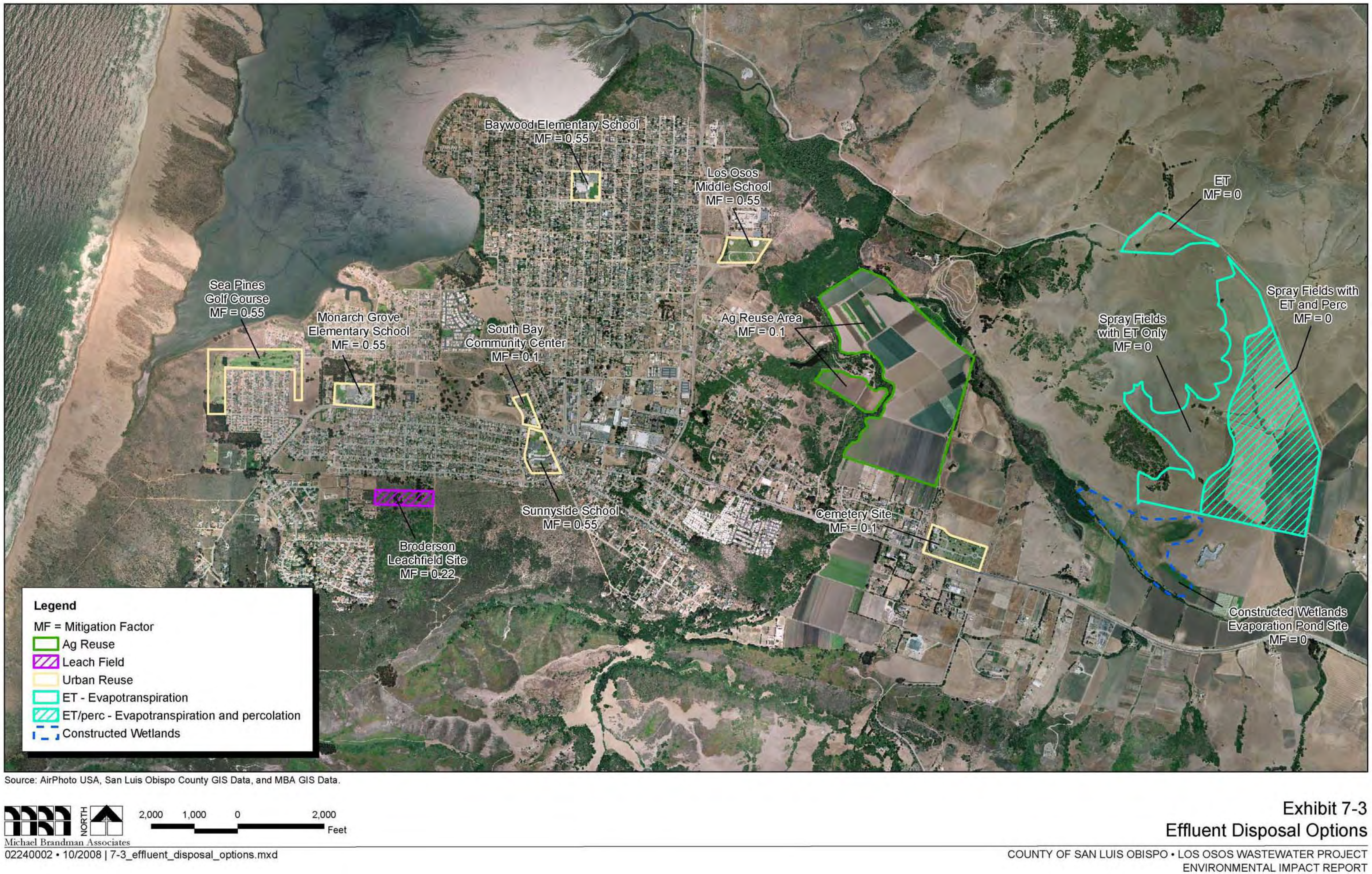


Figure 5.4 Effluent Disposal and Recycled Water Reuse Alternatives



5.6. ENVIRONMENTAL IMPACTS

Analysis of the potential environmental impacts is included in the environmental documents. The project objective, relative to environmental impacts, is avoidance as the first priority. Any impacts to sensitive habitat or resources that cannot be avoided will be fully mitigated. There will be not direct or indirect impacts on important environmental resources.

Virtually all of the collection system and recycled water distribution components to be constructed will be located in existing roadways or other previously disturbed areas. Where it is necessary for the pipeline routes to cross Los Osos Creek, both the raw wastewater and recycled water mains will be hung from the existing bridge. The primary exception to the impacts avoidance objective is the 8 acres of leachfields on the Broderson site, which is a sensitive habitat area. The impacts at Broderson will be mitigated by the preservation of the remaining 80 acres of the site as permanent open space and species habitat. The treatment facility and associated solids handling facility will be located on previously disturbed land under all site alternatives.

5.7. CARBON FOOTPRINT/GREENHOUSE GAS EMISSIONS

The project alternative analysis included consideration of global warming impacts, in response to California Assembly Bill 32, which mandates that these issues be considered and a reduction in greenhouse gases. Greenhouse gas emission were analyzed in a Technical Memorandum and, separately, in the project EIR. The table below is a summary of the analysis, which compares collection system and treatment process alternatives, while assuming that effluent reuse is a combination of leachfields and irrigation and that solids handling is hauling unclassified sludge to a nearby landfill or composting facility. Gravity collection and extended aeration treatment processes (oxidation ditch/Biolac) were found to have the least carbon footprint of the collection and treatment alternatives.

Table 5.3 Greenhouse Gas Emissions Summary: Annual Metric Tons of CO_2 Equivalent

	Indirect						Direct	Total
Alternatives	**Operations Energy**	**Construction Production**	**Chemical Production**	**Construction Materials**	**Solids & Septage**	**Chemical Handling**	**Septic Tank Venting**	**Metric Tons CO_2 equivalent**
Existing Septic Systems	0	0	0	0	16	0	840	**856**
Gravity w/ Oxidation Ditch	769	143	48	32	47	22	0	**1,061**
STEP/STEG w/ Oxidation Ditch	549	103	389	22	14	23	624	**1,724**
Gravity w/ BIOLAC	657	136	47	38	47	22	0	**947**
STEP/STEG w/ BIOLAC	464	99	389	26	14	23	624	**1,639**
Gravity w/ Fac. Ponds	655	138	389	49	9	20	0	**1,260**
STEP/STEG w/ Fac. Ponds	560	100	389	39	10	21	624	**1,742**

5.8. PUBLIC PARTICIPATION/COMMUNITY SURVEY

The County has created several ongoing opportunities for public involvement and input on the wastewater project. These include regular (weekly or monthly) public hearings at the Board of Supervisors and TAC, town-hall and open house style community meetings, a project website with up-to-date information and documents, email and web-log forums for asking questions or posting comments, and a community-wide project survey that was mailed to all residents and property owners. The community survey was conducted in February, 2009, following the engineering alternatives analysis in the Rough and Fine Screening Reports and Technical Memoranda, and after the release of the draft EIR. The survey questions focused on costs and issues that affected individual residents, the overall community, or the environment. The results of the survey are advisory only and are used by County decision-makers in considering the project.

5.9. LAND REQUIREMENTS

A summary of land requirement is provided below. Additional information is available in the Alternative Description and Advantages/Disadvantages discussions in this section and in the attached documents.

a. <u>Collection System</u>. Land requirements are similar for the pipeline portion of each collection system alternative. However, there are some important distinctions between the alternatives for the other collection system facilities. The gravity system requires nine pumps stations and thirteen pocket pump stations. All of these will be located in the road right-of-way or other publically owned land and all of the locations have been evaluated and previously permitted by the environmental resource agencies for the LOCSD project. Each of the alternative collection systems (STEP/STEG, vacuum, or low pressure grinder pumps) require on-site tanks or vaults to be installed on each property. Due to the density of the development in Los Osos it is likely that there will be conflicts with other facilities that will result in delays or increased costs. Vacuum systems also require large, above-grade vacuum stations, in addition to underground pump stations. No locations for these vacuum stations have been identified.

b. <u>Treatment Process and Solids Handling</u>. Land requirements for the treatment process alternatives generally range from 5 to 10 acres for all of the extended aeration/activated sludge and the attached growth/fixed media technologies. Land requirements for the Advanced Wastewater Treatment Ponds are more variable and range from 20 acres for Partially Mixed Facultative Ponds to 60 to 90 acres conventional Facultative Ponds. The acreage estimates include allowances for appurtenant facilities including administration and maintenance buildings, tertiary treatment processes, and most solids handling alternatives.

c. <u>Effluent Reuse and Disposal</u>. Land requirements for effluent reuse or disposal consist of the 8 acres at the Broderson site for leachfields and approximately 10 acres at the Giacomazzi site for storage ponds to facilitate irrigation reuse options. The urban and agricultural reuse options do require any additional land, or land use conversion. The existing uses of these sites will be maintained, but irrigated with recycled, rather than potable, water. Sprayfields would require up to several hundred acres, depending on the capacity required. It would be necessary to convert the land from its previous use for dedicated irrigation of crops which have a high water intake capacity. Percolation ponds and terminal wetlands would require large amounts of land in order to have significant capacity. No suitable location for these facilities was identified in the alternatives review.

5.10. CONSTRUCTABILITY ISSUES

The treatment facility site alternatives are large, greenfield, sites with suitable soil conditions and no existing facilities to avoid. Constructability issues for the project are largely focused on the collection system, with the following key issues.

- Sandy Soil: The community of Los Osos is an ancient sand dune and virtually all of the collection system pipelines will be installed in sandy soil. The soil typical will maintain vertical excavations for a period of time. However, shoring and sheeting will likely be required for worker safety and constructability.
- High Groundwater: Selected portions of the planned collection system are in areas of high groundwater. These areas have been mapped, with depth-to-groundwater contours developed. This information will be available to potential contractors, prior to submitting bids. It is expected that extensive dewatering operations and/or alternative construction techniques such as trenchless pipe installation will be required in limited areas.
- Utility Conflicts: Utility mapping and coordination was completed for the entire collection system area as part of the LOCSD’s project in 2005. Any new development since 2005 has been tracked and coordinated to avoid potential conflicts with the planned sewer pipelines. However, portions of the potable water system are not well mapped and contains transite pipe, which is difficult to locate. A pre-construction potholing program will be required as part of the construction contract.
- Cultural Resources: There is a long history of Native American settlements in the Los Osos area. Extensive archeological surveys were conducted for the entire collection system prior to the LOCSD’s project in 2005. Pipeline routes were designed to avoid sensitive areas when possible. The construction contract will have provisions for addressing delays and construction impacts associated with encountering artifacts in the pipeline excavations.
- On-lot Construction: The gravity collection system alternative will only be constructed within the public right-of-way or easements. Sewer laterals will be constructed to the edge of the right-of-way and all on-lot lateral connections and septic tanks abandonment will be the responsibility of the individual property owner. The other collection system alternatives (STEP/STEG, vacuum, and low pressure grinder pumps) require some type of holding tank, septic tank, or pump vault to be installed on private property at each of the approximately 4,800 connections. Since these facilities must be properly maintained in order to ensure reliable system operation, the County would be responsible for the installation and maintenance. The individual property owner coordination, yard

restoration, site constraints, and contractor liability for each of the 4,800 connections would present significant constructability issues.

5.11. COST ESTIMATES

Cost estimates were developed in the Fine Screening Report, and in subsequent technical memoranda for each of the project components. The following tables summarize the cost estimates for construction, non-construction (soft costs), and operations and maintenance.

Tables 5.4 through 5.14 summarize construction and operations and maintenance costs in 2007 dollars (ENR 7879) for the collection system, treatment facility, solids handling, and effluent reuse and disposal alternatives.

Table 5.15 and 5.16 provide a summary of the total project construction costs, non-construction capital costs and long-term operations and maintenance costs.

Table 5.4 Range of Probable Costs for Gravity Collection System

Item [2]	Range of Probable Costs: Low ($M)[1]	Range of Probable Costs: High($M) [1]	Notes on Development of Range
Mobilization/Demobilization/ General Conditions	3.7	4.0	Based on 5% of Construction Cost Subtotal
COMMON FACILITIES			
Gravity Sewers and Force Mains	27.8	30.6	Low estimate based on Carollo Engineer's Unit Price Catalog with 15% contractor overhead and profit and 8% sales tax. High estimate includes 10% contingency due to final design level.
Manholes	4.3	4.7	Low estimate based on Carollo Engineer's Unit Price Catalog with 15% contractor overhead and profit and 8% sales tax. High estimate includes 10% contingency due to final design level.
Shoring and Dewatering	4.8	5.3	Low estimate based on Carollo Engineer's Unit Price Catalog with 15% contractor overhead and profit and 8% sales tax. High estimate includes 10% contingency due to final design level.
Duplex Pump Station	2.6	2.6	Based on Bid Tab values.
Triplex Pump Station	1.2	1.2	Based on Bid Tab values.
Pocket Pump Station	2.4	2.4	Based on Bid Tab values.
Standby Power Facility	2.5	2.5	Based on Bid Tab values.
Miscellaneous Facility Requirements	3.3	3.3	Based on Bid Tab values.
Laterals in Right of Way	8.8	9.7	Low estimate based on Carollo Engineer's Unit Price Catalog with 15% contractor overhead and profit and 8% sales tax. High estimate includes 10% contingency due to final design level.
Road Restoration	5.2	5.2	Based on bid assessment by the Wallace Group, March 2005
Land and Easement Acquisition	Assumed No Additional Cost [3]		

Table 5.4 Range of Probable Costs for Gravity Collection System

Item [2]	Range of Probable Costs Low ($M)[1]	High($M) [1]	Notes on Development of Range
ON-LOT FACILITIES			
Project Facilities	0.0	0.0	All on-lot costs assumed to be bourne by the individual homeowners for gravity/low pressure systems
Homeowner Facilities	12.6	13.9	Based on on-lot options and cost development information presented above. High estimate includes 10% contingency.
Overhead and Profit (15%)	Included Above [4]	Included Above [4]	
Subtotal	$79.3	$85.5	
Sales Tax (8%)	Included Above [4]	Included Above [4]	
Conveyance to Out-of-Town Treatment Facility	2.9	4.1	
TOTAL CONSTRUCTION COST	**$82.2**	**$89.6**	

Notes:
(1) All costs in April 2007 dollars, based on an ENR of 7879.
(2) Prohibition zone lots only - 4,769 connections.
(3) Land and easement acquisition assumed to be sunk cost as part of previous Tri-W project.
(4) Contractor overhead and profit and sales tax assumed included in bid tab values. Where Unit Price Catalog estimates are used, contractor overhead and profit (15%) and sales tax (8%) are included in the individual line items.

Table 5.5 Range of Probable Costs for Low Pressure Collection System (LPCS)

Item [2]	Range of Probable Costs		Notes on Development of Range
	Low ($M) [1]	High ($M) [1]	
Mobilization/Demobilization/General Conditions	3.0	3.9	Based on 5% of Construction Cost Subtotal.
COMMON FACILITIES[5]			
Force Mains and Laterals in Right-of-Way	11.7	15.2	Low estimate based on Los Osos Wastewater Management Plan Update (Ripley 2006) and installation costs from Tidwell. High estimate includes 30% contingency due to conceptual design level.
Duplex Pump Station (6)	2.6	2.6	Based on Bid Tab Values and Table 3.1, Fine Screening Report
Triplex Pump Station (2)	1.2	1.2	Based on Bid Tab Values and Table 3.1, Fine Screening Report
Standby Power Facility (7)	2.5	2.5	Based on Bid Tab Values and Table 3.1, Fine Screening Report
Miscellaneous Facility Requirements	3.3	3.3	Based on Bid Tab Values and Table 3.1, Fine Screening Report
Odor Control	0.1	0.3	Low and High estimates based on 100 and 500 air release valves respectively at $500 each.
Road Restoration	1.3	2.6	Low and High estimates based on 25% and 50% of the gravity system requirements, respectively, due to estimated reduction in pavement disturbance.
Land and Easement Acquisition	Assumed No Additional Cost[3]	Assumed No Additional Cost[3]	
ON LOT FACILITIES			
Project Facilities	21.8	24.0	All on-lot costs assumed to be borne by the individual homeowners for low pressure systems
Homeowner Facilities	6.6	7.3	Based on on-lot options and cost development information presented above. High estimate includes 10% contingency similar to gravity system.
Electrical Connection	9.1	18.1	Low and High estimates based on community average costs of $1,900 and $3,800 per connection as presented in Table 8 for 4769 Prohibition Zone lots.
Subtotal	$63.2	$81.0	
Overhead and Profit (15%)	$9.5	$12.2	
Subtotal	$72.7	$93.2	
Sales Tax (8%)[4]	$2.9	$3.7	
TOTAL CONSTRUCTION COST[6]	$75.6	$96.9	

Notes:
(1) All costs in April 2007 dollars, based on an ENR of 7879.
(2) Prohibition Zone lots only - 4769 connections.
(3) Land and easement acquisition assumed to be sunk cost as part of the previous Tri-W project.
(4) Sales Tax included on materials only. Assumed 60 percent materials cost for common and on-lot facilities.
(5) Common Facilities estimates assumed to be the same for low pressure system as for STEP system.

Table 5.6 Range of Probable Costs for STEP/STEG Collection System

Item (2)	Range of Probable Costs Low ($M) (1)	High ($M) (1)	Notes on Development of Range
Mobilization/Demobilization /General Conditions	2.6	3.2	Based on 5% of Construction Cost Subtotal.
COMMON FACILITIES			
Force Mains and Laterals in Right-of-Way	11.7	15.2	Low estimate based on Los Osos Wastewater Management Plan Update (Ripley 2006) and installation costs from Tidwell. High estimate includes 30% contingency due to conceptual design level.
Odor Control	0.1	0.3	Low and High estimates based on 100 and 500 air release valves respectively at $500 each.
Road Restoration	1.3	2.6	Low and High estimates based on 25% and 50% of the gravity system requirements, respectively, due to estimated reduction in pavement disturbance.
Land and Easement Acquisition	Assumed No Additional Cost(3)	Assumed No Additional Cost(3)	
ON LOT FACILITIES			
Project Facilities	23.5	25.8	Based on on-lot options and cost development information presented above. High estimate includes 10% contingency similar to gravity system.
Homeowner Facilities	6.1	6.7	Based on on-lot options and cost development information presented above. High estimate includes 10% contingency similar to gravity system.
Electrical Connection	9.1	14.3	Low and High estimates based on $1,900 and $3,000 per connection as presented in Table 3.15 for 4769 Prohibition Zone lots.
Subtotal	$54.4	$68.1	
Overhead and Profit (15%)	$8.1	$10.2	
Subtotal	$62.3	$78.3	
Sales Tax (8%)(4)	$2.5	$3.1	
TOTAL CONSTRUCTION COST WITH BASE ELECTRICAL CONNECTION	$65.0	$81.4	
Separate Electrical Service Premium	$14.5	$24.1	
TOTAL CONSTRUCTION WITH SEPARATE ELECTRICAL SERVICE PREMIUM	$79.5	$105.5	

Notes:
(1) All costs in April 2007 dollars, based on an ENR of 7879.
(2) Prohibition Zone lots only - 4769 connections.
(3) Land and easement acquisition assumed to be sunk cost as part of the previous Tri-W project.
(4) Sales Tax included on materials only.

Table 5.7 Estimated O&M Costs for Gravity Collection System

Item	Units	Quantity	Unit Price ($)	Annual O&M ($)
Labor	Hrs/year	4,160(1)	40(2)	170,000
Power	Kwh/year	500,000(3)	0.12(2)	60,000
Equipment Maintenance/ Replacement	%/year	2	Pump Station Power Facility and Misc Facility Requirements Construction Cost	250,000
TOTAL O&M COST(4)				$480,000

Notes:
(1) Based on 2 full-time employees and 2,080 hours per year.
(2) From Basis of Cost Evaluation Technical Memorandum.
(3) Based on energy required to convey 1.4 mgd to an out-of-town treatment facility.
(4) Septic hauling costs for homes outside of the Prohibition Zone are not included.

Table 5.8 Estimated O&M Costs for Low Pressure Collection System (LPCS)

Item	Units	Quantity	Unit Price ($)	Annual O&M ($)
Labor	Hrs/year	10,400(1)	40(2)	420,000
Power	kWh/year	860,000(3)	0.12(2)	100,000
Electrical Maintenance/ Replacement	%/year	1	Electrical Connection Construction Costs	90,000
Pump/Controls Maintenance/ Replacement	Pumps/year	700(4)	1,200-2,000(5)	840,000-1,400,000
Odor Control Maintenance/ Replacement	%/year	20	Odor Control Construction Costs	20,000
TOTAL O&M COST				~$1,500,000- $2,000,000

Notes:
(1) Based on 5 full-time employees from Horseshoe Bay, Hot Springs, and other case studies contacted. Full-time equivalent (FTE) employee based on 2,080 hours per year.
(2) From Basis of Cost Evaluation Technical Memorandum (Carollo, August 2007).
(3) Based on energy required to convey 1.2 mgd to an out-of-town treatment facility. Assumed a grinder pump efficiency of 30 percent.
(4) Assumes full pump replacement every 7 years.
(5) Range based on replacement pump costs for case studies contacted.

Table 5.9 Estimated O&M Costs for STEP/STEG Collection System

Item	Units	Quantity	Unit Price ($)	Annual O&M ($)
Labor	Hrs/year	5,200[(1)]	40[(3)]	210,000
Power	kWh/year	425,000[(4)]	0.12[(3)]	50,000
Electrical Maintenance/Replacement	%/year	1	Electrical Connection Construction Costs	90,000
Pump/Controls Maintenance/Replacement	Pumps/year	700[(5)]	400[(6)]	280,000
Odor Control Maintenance/Replacement	%/year	20	Odor Control Construction Costs	20,000
Septic Hauling[(7)]	Tanks/year	950[(8)]	150[(2)]	140,000
TOTAL O&M COST				~$790,000

Notes:
(1) Based on 2.5 full-time employees from Charlotte County Utility Authority, Florida, Olympia and other case studies contacted for Rough Screen Analysis. FTE based on 2,080 hours per year.
(2) Based on 1.5 full-time employees at $40/hour and $150,000 for septic hauling truck replaced every 10 years.
(3) From Basis of Cost Evaluation Technical Memorandum.
(4) Based on energy required to convey 1.2 mgd to an out-of-town treatment facility.
(5) Assumes pump replacement every 7 years.
(6) Based on pump cost provided by Orenco.
(7) Septic hauling costs for homes outside of the Prohibition Zone are not included.
(8) Based on anticipated RWQCB requirement for STEP tank pumping frequency of once every 5 years.

Table 5.10 Summary of Treatment Alternative Costs

	Costs[1,2]	Treatment Alternative ($M)						
		Extended Aeration MLE	**BIOLAC®**	**Sequencing Batch Reactor (SBR)**	**Oxidation Ditch**	**Trickling Filters**	**Partially Mixed Facultative Ponds**	**Membrane Bio-Reactor (MBR)**
Gravity Collection System	Secondary Treatment Construction Costs	$22.2	$17.2	$23.0	$19.6	$20.5	$14.7	$55.0
	Secondary Treatment O&M Costs	$700,000	$700,000	$660,000	$690,000	$670,000	$510,000	$740,000
	Nitrification Facilities Construction Costs [3,4]	-	-	-	-	$3.8	$1.0 - 3.8[6]	-
	Nitrification Facilities O&M Costs [3,4]	-	-	-	-	$90,000	$30,000 - $90,000[6]	-
	Denitrification Facilities Construction Costs [3]	-	-	-	-	$3.6	$3.6	-
	Denitrification Facilities O&M Costs [3]	-	-	-	-	$250,000	$250,000	-
STEP Collection System	Secondary Treatment Construction Costs	$19.1	$14.2	$19.4	$16.5	$17.6	$13.7	N/A
	Secondary Treatment O&M Costs	$570,000	$550,000	$590,000	$570,000	$610,000	$510,000	N/A
	Nitrification Facilities Construction Costs[3,4]	-	-	-	-	$3.3	$1.0 - 3.3[6]	-
	Nitrification Facilities O&M Costs[3,4]	-	-	-	-	$90,000	$30,000 - 90,000[6]	-
	Denitrification Facilities Construction Costs[3]	$3.6	$3.6	$3.6	$3.6	$3.6	$3.6	$3.6
	Denitrification Facilities O&M Costs[3]	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000
Gravity or STEP	Tertiary Treatment Construction Costs[8]	$1.6 - 3.5	$1.6 - 3.5	$1.6 - 3.5	$1.6 - 3.5	$1.6 - 3.5	$2.1 - 4.0[5]	-[7]
	Tertiary Treatment O&M Costs[8]	$30,000 - 100,000	$30,000 - 100,000	$30,000 - 100,000	$30,000 - 100,000	$30,000 - 100,000	$60,000 - 130,000[5]	-[7]

Notes:
(1) All costs are in April 2007 dollars, based on an ENR of 7879.
(2) Total construction costs do not include design, construction management, and legal/administrative costs. Refer to Chapter 7 for project costs.
(3) Assumed nitrification /denitrification of full plant flow to meet seasonal disposal/ reuse requirements.
(4) Trickling filters and facultative ponds require nitrification upstream of denitrification.
(5) Includes additional pre-treatment costs due to high suspended solids effluent from facultative ponds.
(6) Low costs assume fully nitrifying pond system feasible. High costs assume implementation of nitrifying trickling filters.
(7) MBR effluent quality meets Title 22 requirements without additional treatment.
(8) Tertiary cost range dependent on flowrate, upper range is for 1.2 MGD
(9) Includes 30% contingency for all capital cost estimates.

Table 5.11 Capital Cost Summary for Solids Treatment Alternatives

	Assumed Treatment Processes On Site	Estimated Capital Cost with Gravity Collection System ($M)(1)	Estimated Capital Cost with STEP/STEG Collection System ($M)(2)
Facultative Pond	Facultative Pond	0	0
Sub-Class B Biosolids(3)	Gravity Belt Thickening Solar Drying	1.9 - 2.4 (2.6 - 3.3 with BFP Dewatering)	1.0 - 1.7 (1.4 - 2.4 with BFP Dewatering)
Digested Class B Biosolids	Gravity Belt Thickening Aerobic Digestion Solar Drying	4.6 - 5.1 (5.3 - 6.0 with BFP Dewatering)	2.4 - 3.5 (2.8 - 4.2 with BFP Dewatering)
Heat Dried Class B Biosolids	Gravity Belt Thickening Belt Filter Press Dewatering Indirect Heat Drying	5.5 - 6.2	3.0 - 4.4
Composted Class B Biosolids	Gravity Belt Thickening Belt Filter Press Dewatering Windrow Composting	3.6 - 4.3	1.9 - 3.2
Composted Class A Biosolids	Gravity Belt Thickening Belt Filter Press Dewatering Windrow Composting	3.6 - 4.3	1.9 - 3.2
Digested/ Composted Class A Biosolids	Gravity Belt Thickening Aerobic Digestion Belt Filter Press Dewatering Windrow Composting	6.3 - 7.0	3.3 - 5.0

Notes:
(1) Based on an average solids volume from primary and secondary treatment process of 4,000 pounds per day (dry weight).
(2) Based on an average solids volume from primary and secondary treatment process of 1,000 pounds per day (dry weight).
(3) The Tri-W Project included treatment and disposal of Sub-class B biosolids.
(4) Includes 30% contingency for all estimates.

Table 5.12 O&M Cost Summary for Solids Treatment Alternatives

	Assumed Treatment Processes On Site	Estimated O&M Cost with Gravity Collection System ($M)[1]	Estimated O&M Cost with STEP/STEG Collection System ($M)[2]
Facultative Pond	Facultative Pond Temporary Equipment	0.04 – 0.05[3]	0.03 – 0.04[3]
Sub-Class B Biosolids[4]	Gravity Belt Thickening Solar Drying Hauling	0.43 – 0.47 (0.63 - 0.66 with BFP Dewatering)	0.18 – 0.25 (0.28 – 0.38 with BFP Dewatering)
Digested Class B Biosolids	Gravity Belt Thickening Aerobic Digestion Solar Drying Hauling	0.43 – 0.47 (0.63 – 0.66 with BFP Dewatering)	0.18 – 0.25 (0.28 – 0.38 with BFP Dewatering)
Heat Dried Class B Biosolids	Gravity Belt Thickening Belt Filter Press Dewatering Indirect Heat Drying Hauling	0.60 – 0.62	0.30 – 0.42
Composted Class B Biosolids	Gravity Belt Thickening Belt Filter Press Dewatering Windrow Composting Hauling	0.68 – 0.71	0.35 – 0.48
Composted Class A Biosolids	Gravity Belt Thickening Belt Filter Press Dewatering Windrow Composting Hauling	0.62 – 0.65	0.33 – 0.46
Digested/ Composted Class A Biosolids	Gravity Belt Thickening Aerobic Digestion Belt Filter Press Dewatering Windrow Composting Hauling	0.63 – 0.66	0.33 – 0.46

Notes:
(1) Based on an average solids volume from primary and secondary treatment process of 4,000 pounds per day (dry weight).
(2) Based on an average solids volume from primary and secondary treatment process of 1,000 pounds per day (dry weight).
(3) Based on $600,000 in 2007 dollars escalated at 5% per year until 2027 and saved for in equal annual installments.
(4) The Tri-W Project included treatment and disposal of Sub-class B biosolids.

Table 5.13 Capital Cost Summary for Effluent Reuse and Disposal Alternatives

Item	Estimated Costs	Notes
Conservation Program	$1,000,000 - $5,000,000	1
Piping to Sprayfield	$1,210,000 – $1,650,000	2
Sprayfield Development	$20,000 - $80,000	3
Sprayfield Maintenance Equipment	$700,000 - $2,800,000	4
Sprayfield Land Acquisition	$1,800,000 - $7,000,000	5
Recycled Water Storage Ponds	$400,000 - $3,900,000	6
Recycled Water Pump Station	$780,000 - $1,500,000	7
Recycled Water Return Main to Broderson	$2,200,000 - $2,900,000	8
Broderson Leachfield Development	$2,367,000	9
Urban Reuse Turnout Piping	$1,400,000 - $2,100,000	10

(1) Minimum program: 5000 toilets at $200 each.
(2) 10,500 ft from Giacomazzi to Tonini.
(3) $209/acre.
(4) $256/acre/year for 30 years.
(5) $30,000/acre for spray fields, capped at $7m (price of Tonini Ranch).
(6) Range from 30 AF to 290 AF storage.
(7) See costs in treatment plant information.
(8) 17,700 ft from plant to Broderson.
(9) Based on bid tabs for LOCSD project.
(10) Estimate 10,000 lf to 15,000 lf for turnouts to ag sites, schools, and Sea Pines at $143/lf.
(11) Includes 30% contingency for all estimates.
(12) Cost estimates summarized from Table A1 of Fine Screening Report (Carollo, August, 2007) for Alternatives 1a & 1b, 2a & 2b, and 3a & 3b.

Table 5.14 O&M Cost Summary for Effluent Reuse and Disposal Alternatives

Item	Estimated Annual O&M Cost	Notes
Sprayfields		
Energy	$67,000 - $187,000	1
Labor	$0 - $89,000	2
Leachfields		
Energy	$160,000 - $170,000	3
Labor	$90,000	4
Recycled Water Reuse		
Energy	$34,000 - $44,000	5

(1) Energy from pumping plus fuel for spray field maintenance machinery.
(2) Labor for spray field maintenance - $40/hr.
(3) Energy from pumping and leachfield maintenance.
(4) Labor for leachfield maintenance - $60/hr.
(5) Energy from pumping to ag land.
(6) Cost estimates summarized from Table A1 of Fine Screening Report (Carollo, August, 2007) for Alternatives 1a & 1b, 2a & 2b, and 3a & 3b.

Table 5.15 Total Project Capital Cost Summary ($ Millions)

Project Element		Seawater Intrusion Mitigation Level 1		Seawater Intrusion Mitigation Level 2		Seawater Intrusion Mitigation Level 3		Tri-W Project
		90 AFY	140 AFY	190 AFY	240 AFY	550 AFY	600 AFY	~285 AFY
Collection System	STEP	$65 - 81	$65 - 81	$65 - 81	$65 - 81	$65 - 81	$65 - 81	$N/A
	Gravity(7)	$82 - 90	$82 - 90	$82 - 90	$82 - 90	$82 - 90	$82 - 90	$81 - 82
Treatment (Liquid and Solids) (2)	STEP	$14 - 18	$23 - 25	$20 - 22	$23 - 25	$23 - 25	$23 - 25	N/A(8)
	Gravity	$15 - 22	$23 - 26	$20 - 22	$23 - 26	$23 - 26	$23 - 26	$55
Disposal/Reuse		$13 - 16	$13 - 14	$15 - 17	$13 - 14	$26 - 30	$26 - 27	$20 - 23
Treatment Facility Site(3)		$1 - 3	$1 - 3	$1 - 3	$1 - 3	$1 - 3	$1 - 3	$1 - 3
Permitting/Mitigation(4)		$1 - 2	$1 - 2	$1 - 2	$1 - 2	$1 - 2	$1- 2	$1 - 2
Total Construction Costs	STEP	$94-120	$103 - 126	$102-125	$103-126	$116-142	$116-139	N/A
	Gravity	$110-130	$118-133	$117-132	$119-133	$132-149	$131-146	$155 - 162
Total Construction Costs Escalated to Mid-Point of Construction(5)	STEP	$117-150	$128-157	$126-156	$129-157	$144-176	$144-173	N/A
	Gravity	$137-162	$147-166	$146-164	$148-165	$164-185	$163-182	$193 - 202
Project Costs(6)	STEP	$18-24	$18-24	$18-24	$18-24	$21-26	$21-26	N/A
	Gravity	$16-21	$16-21	$16-21	$16-21	$19-23	$19-23	$12 - 17
Total Project Costs(5)	STEP	$135-174	$146-181	$144-180	$147-181	$166-202	$165-199	N/A
	Gravity	$153-183	$163-187	$161-185	$163-186	$182-208	$182-205	$205 - 219

N/A - Not Available.

Notes:

(1) Estimated Construction Costs in April 2007 dollars including contractor overhead and profit and 30% design contingency (feasibility-level estimate).
(2) Shows combined costs of liquid treatment and solids treatment/disposal.
(3) Assumes approximately 40 acres acquired, except for Tri-W Project. Actual acreage may vary depending on the final site and plant configuration.
(4) Costs do not include land restoration costs at $20,000 to $50,000 per acre.
(5) Assumes mid-point of construction is June 2011. Escalation at 24.5% of construction cost sub-total per the Basis of Cost Evaluation (Carollo Engineers, May 2007).
(6) Project costs include design, construction management, administration and legal costs, as detailed in the Basis of Cost Memorandum in Appendix A of Fine Screening Report (Carollo, August, 2007).
(7) Cost do not include $13 to 25 million for electrical connection premium for separate electrical service that may be incurred if permitting and/or funding requirements stipulate this requirement and the funding is pursued.
(8) Tri-W costs based on gravity collection system. Treatment Costs for the Tri-W Project with STEP collection are not available from bid tab information. Based on other treatment process costs, MBR costs associated with STEP collection could be approximately 10 to 15% less than when associated with a gravity collection system.

Table 5.16 Total Project O&M Cost Summary ($ Millions)

Project Element		Seawater Intrusion Mitigation Level 1		Seawater Intrusion Mitigation Level 2		Seawater Intrusion Mitigation Level 3		Tri-W Project
		90 AFY	140 AFY	190 AFY	240 AFY	550 AFY	600 AFY	~285 AFY
Collection System	STEP Gravity	$0.8 $0.5	$0.8 $0.5	$0.8 $0.5	$0.8 $0.5	$0.8 $0.5	$0.8 $0.5	N/A $0.7
Treatment	STEP Gravity	$0.5-0.6 $0.5-0.7	$0.9-1.8 $0.8-1.8	$0.8-1.7 $0.7-1.7	$0.9-1.8 $0.8-1.8	$0.9-1.8 $0.8-1.8	$0.9-1.8 $0.8-1.8	N/A(4) $0.7
Solids (Sub Class B)(2)	STEP Gravity	$0.03-0.3 $0.04-0.5	$0.03-0.3 $0.04-0.5	$0.03-0.3 $0.04-0.5	$0.03-0.3 $0.04-0.5	$0.03-0.3 $0.04-0.5	$0.03-0.3 $0.04-0.5	N/A $0.5
Disposal/ Reuse	STEP Gravity	$0.1-0.3 $0.1-0.3	$0.1-0.2 $0.1-0.2	$0.4 $0.4	$0.4 $0.4	$0.1-1.1 $0.1-1.1	$0.3 $0.3	N/A $0.4 - 0.5
Total O&M Costs	STEP Gravity	$1.4 - 1.9 $1.1 - 1.9	$1.8 - 3.0 $1.4 - 2.9	$2.0 - 3.1 $1.6 - 3.0	$2.1 - 3.2 $1.7 - 3.2	$1.8 - 3.9 $1.4 - 3.8	$2.0 - 3.1 $1.6 - 3.0	N/A $2.3 - 2.4(3)

N/A - Not Available.
Notes:
(1) Estimated O&M Costs in April 2007 dollars.
(2) Low costs are based on an annuity to fund temporary, mobile facilities for removal of solids from facultative ponds 20 years following startup of the wastewater treatment facilities.
(3) Does not include $0.4 million for water conservation, habitat mitigation, overhead, administration and contingency to correspond to the Final Project Report (Montgomery Watson Americas, March 2001) estimate. See Table 7.2 of Fine Screening Report (Carollo, August, 2007).
(4) Tri-W costs based on gravity collection system. Treatment Costs for the Tri-W Project with STEP collection are not available from bid tab information. Based on other treatment process costs, MBR costs associated with STEP collection could be approximately 10 to 20% less than when associated with a gravity collection system.

5.12. ADVANTAGES/DISADVANTAGES

The following tables (Table 5.17 through Table 5.21) provide a summary of advantages, disadvantages, and project issues associated with each component of the project alternatives. The discussion includes collection system, treatment process, effluent reuse and disposal, solids handling, and treatment facility sites.

Table 5.17 Collection System Alternatives – Advantages, Disadvantages and Issues

Collection System	Advantages	Disadvantages	Operations & Maintenance Issues
Conventional Gravity	• Limited infrastructure and construction disturbance to individual properties • Reserve hydraulic capacity • Power required only at pump stations • Designed as part of LOCSD project • No proprietary technology	• Several lift stations required • Deep excavations for pipe installation • Requires larger pipes and manholes • Significant I/I	• Lift stations must be maintained • Reduced septage handling
STEP/STEG	• May utilizes existing septic systems if in acceptable condition (no off-site pump stations required) • Shallow excavation for pipe installation • Small pipes and no manholes • Minimal I/I • Reduced organic and suspended solids loading • Reduced biosolids production and associated hauling	• Significant infrastructure and construction disturbance to individual properties (septic tanks are typically replaced because of I&I and previous studies have estimated 85 to 100% of tanks to be replaced) • Dedicated power supply required at individual properties • Limited hydraulic capacity • Requirement to add supplemental organic material for denitrification in treatment process	• Recurring disturbance to inspect and maintain septic tanks and pumps on individual properties (Blanket easement likely required) • Increased septage handling • Privatization option may reduce costs • RWQCB may impose monitoring system and additional maintenance requirements not accounted for in previous studies/estimates

Table 5.17 Collection System Alternatives – Advantages, Disadvantages and Issues

Collection System	Advantages	Disadvantages	Operations & Maintenance Issues
Vacuum	• Limited infrastructure and construction disturbance to individual properties • Shallow excavation for pipe installation • Small pipes and no manholes • Minimal I/I • Power only required at the vacuum stations	• Only one manufacturer of vacuum systems (AIRVAC) • Collection chambers and several vacuum stations required • Limited hydraulic capacity	• Vacuum stations and interface valves must be maintained • Reduced septage handling
Low Pressure	• Minimized clogging because of grinder pumps • Shallow excavation for pipe installation • Small pipes and no manholes • Minimal I/I	• Significant infrastructure and construction disturbance to individual properties • Primary and back-up power supply required at individual properties • Limited hydraulic capacity • Lift stations may be required	• Recurring disturbance to maintain pumps and power source on individual properties (Blanket easement likely required) • Reduced septage handling • Privatization options to be investigated
Combined (Gravity/ Vacuum/ Low Pressure)	• Can optimize technology for localized conditions • Previously designed gravity system serves as design basis	• Similar to individual collection systems • Non-uniformity of design and construction	• Multiple techniques required to operate and maintain system

Table 5.18 Treatment Process Alternatives – Advantages, Disadvantages and Issues

Treatment Alternative	Relative Construction Cost	Relative O & M Cost	Estimated Acreage Required [1,2] (Acres)	Approximate Nitrogen Removal Capabilities (mg/L)[(4)]	Relative Energy Usage	"Good Neighbor" Features
Suspended Growth Activated Sludge						
Extended Aeration MLE	Moderate	Moderate	6	Probably less than10	Moderate	• Odor treatment as necessary • Low noise/enclosable equipment • Covered facility not cost-effective
Membrane Bio-Reactor (MBR)	High	Moderate	4[3]	Probably less than10	High	• Odor treatment as necessary • Low noise/enclosable equipment • Covered facility for multi-use options feasible
BIOLAC®	Low	Low	10	Probably less than10	Low	• Basin size prohibits odor control • Low noise/enclosable equipment • Covered facility not feasible
Sequencing Batch Reactor (SBR)	Moderate	Moderate	6	Probably less than10	Moderate	• Odor treatment as necessary • Low noise/enclosable equipment • Covered facility not cost-effective
Oxidation Ditch	Moderate	Moderate	8	Probably less than10	Moderate	• Odor control as necessary but costly for oxidation ditch • Low noise/enclosable equipment • Covered facility not feasible
Attached-Growth Fixed Media						
Trickling Filters	Moderate	Moderate	5	Probably greater than 10	Low	• Odor control as necessary • Low noise • Covered facility not feasible
Rotating Biological Contactors (RBCs)	Moderate	Moderate	4-6	Probably greater than 10	Low	• Odor treatment as necessary • Low noise • Covered facility not cost-effective
Packed Bed Filters	High	Moderate	4-6	Probably greater than 10	Low	• Odor control as necessary • Low noise • Covered facility not feasible

Table 5.18 Treatment Process Alternatives – Advantages, Disadvantages and Issues

Treatment Alternative	Relative Construction Cost	Relative O & M Cost	Estimated Acreage Required [1,2] (Acres)	Approximate Nitrogen Removal Capabilities (mg/L)[(4)]	Relative Energy Usage	"Good Neighbor" Features
Advanced Wastewater Treatment Ponds						
Advanced Integrated Wastewater Pond System (AIWPS®)	Low	Moderate	64	Probably greater than 10	Low	• Pond size prohibits odor control • Low noise/enclosable equipment • Covered facility not feasible
Facultative Ponds and Constructed Wetlands	Low	Low	60-90	Questionable /Limited Control (Probably greater than 10)	Low	• Limited control of water quality in wetlands • Pond size prohibits odor control • Low noise/enclosable equipment • Covered facility not feasible
Partially Mixed Facultative Ponds	Low	Low	20[(6)]	Questionable /Limited Control (Probably greater than 10)	Low	• Pond size prohibits odor control • Low noise/enclosable equipment • Covered facility not feasible

Notes:
1) Based on Los Osos Wastewater Management Plan Update (Ripley Pacific Team, 2006).
2) Based on Final Project Report (Montgomery Watson Americas, 2001).
3) TRI-W site was 8 acres. However, a significant portion of the space is necessary for community amenities. Acreage estimated is for general MBR facility to be consistent with extended aeration MLE and other alternatives.
4) Processes evaluated are not acceptable for extremely low nitrogen levels required for creek discharge and groundwater injection. A process such as Bardenpho Aeration would be required to achieve sufficient nutrient removal.
5) Costs are relative to an Extended Aeration MLE facility. Conceptual level costs will be developed as part of the detailed evaluation process.
6) Estimated acreage not presented in previous studies. Estimate is based on information from the Wallace Group.

Table 5.19 Effluent Reuse and Disposal Alternatives – Advantages, Disadvantages and Issues

Disposal/Reuse Alternative	Sufficient Local Capacity for all flow?	Winter Storage Required	Affect on Sea Water Intrusion	Treatment Level	Other Issues
Unrestricted Reuse - Urban	No, 132 ac-ft/yr identified	This alternative can only accommodate small fraction of flow year round	Helps mitigate	Disinfected Tertiary	• Can fit future development with purple pipe • Can be used for nitrogen removal
Unrestricted Reuse - Agriculture	Possibly - depends on local farmers' cooperation and using land outside basin Need 500 - 800 acres	Yes, 500 to 650 ac-ft	Helps mitigate if applied within basin, to a lesser degree than urban reuse	Disinfected Tertiary	• Farmers' response to idea has been mixed • Possibility of in-lieu exchange of reuse water for Agricultural well water • Can be used for nitrogen removal
Percolation Pond	Yes	No	Helps mitigate if located within basin	Disinfected Secondary 23 or 2.2	• Must be downwind of residential areas • Area lost to agriculture • Possible loss of biological resources
Leachfield	Not at Broderson Site (limited to 800,000 gpd with harvest wells, 400,000 without harves wells). Would require many sites (more than identified in past reports)	No, if sized for all flow	Helps mitigate if located within basin	Disinfected Secondary 23 or 2.2	• Harvest wells increase capacity, but harvest water disposal is additional issue • Additional cost to transport effluent to west of town (Broderson site) • Area lost to agriculture • Possible loss of biological/archeological resources
Sprayfield	Possibly - depends on using land outside basin Need approximately 600 acres	Yes	Does not address intrusion - most sites outside basin	Disinfected Secondary 23	• Can be used for nitrogen removal • Changes natural wet/dry seasonal cycle, affecting local species
Creek Discharge	Yes	No	Does not address intrusion	Disinfected Tertiary	• Stringent regulations • Species established due to increased flows will be afforded protections
Constructed Terminal Wetlands	Yes	No, if sized for all flow	Helps mitigate if located within basin	Disinfected Secondary 23	• Could be protected by federal and state laws once established • Provides habitat and recreation area
Direct Groundwater Injection	Yes	No	Helps mitigate if located within basin	Disinfected Tertiary with Advanced Oxidation and Reverse Osmosis	• Stringent regulations • Harvest wells increase capacity, but harvest water disposal is additional issue • Possible disruption of biological/archeological resources

Table 5.20 Solids Handling Alternatives – Advantages, Disadvantages and Issues

Solids Treatment	Considerations for Alternative Selection
Sub-Class B Biosolids	Least expensive construction cost Future flexibility for inclusion of digestion and/or composting Most expensive hauling costs Relatively low annual O&M costs Most restrictive disposal option Low acreage requirements Odor problems likely if solar drying used
Digested Class B Biosolids	Relatively high construction cost Future flexibility for inclusion of composting Relatively low annual O&M costs Moderate hauling costs Ability to implement cogeneration (if cost effective)
Heat Dried Class B Biosolids	Least expensive hauling costs (except for local recycling) Moderate to high construction cost Moderate annual O&M costs Low acreage requirements Energy intensive process - economics mostly proportional to price of natural gas
Composted Class B Biosolids	Relatively high construction cost High annual O&M costs Less land required as compared to composting Class A Composting requires large amounts of land More restrictive disposal options as compared to Class A
Composted Class A Biosolids	Relatively high construction cost High annual O&M costs Least restrictive disposal option Composting requires large amounts of land
Digested/ Composted Class A Biosolids	Most expensive alternative overall High annual O&M costs Least restrictive disposal option Composting requires large amounts of land Ability to implement cogeneration (if cost effective)

Table 5.21 Treatment Facility Site Alternatives – Advantages, Disadvantages and Issues

Property	APN	Acre-age	Description/ Topography	Flood Hazard	Access to Infrastructure	Agricultural Land	Biological Resources	Archaeological Resources	Hydro-Geology, Soils and Geologic Hazards	Visual Resources	Proximity of Sensitive Receptors	Proximity to Collection Area and Disposal Sites	Other Site-Specific factors	Advantages	Disadvantages
Cemetery Property	074-222-014	48.1	Rectangular parcel that slopes gently downward to the north; westerly boundary slopes downward to the west to a dirt road that provides access to surrounding farming operations; southerly third of the site is used for a cemetery, about 7 acres in the northwest corner is cultivated with row crops, with the remainder fallow; no trees, or other natural features; useable portion of site is about 22 acres.	None	Close to LOVR, with level, unimproved road bordering on the east that intersects LOVR opposite Clark Valley Road No public water supply Electricity at LOVR?	Class III Northwest portion appears irrigated No LCA contract	No apparent habitat value	Previously identified archaeological site (site 25)	Soils are suitable for building No landslides Potential for Los Osos fault	Site is close to LOVR and visible to passing motorists Gently sloping terrain may help reduce apparent height /prominence of buildings	Cemetery immediately adjacent to the south Residences on five-acre lots adjacent to the west Surrounding properties are ag operations	Useable portion of site is within one eighth mile of LOVR Site appears large enough to support some level of on-site disposal	No known easements or other restrictions	Effective size of the site (about 22 acres) is sufficient to accommodate a wide range of treatment technologies and on-site disposal Accessible from LOVR via intersection with Clark Valley Road No apparent habitat value No known private easement constraints Topography may allow for screening from LOVR Close to service area Less prime farm land, no LCA contract No potential for flooding.	Archaeological resources on property Close to cemetery and closer to residences to the west Expansion plans of cemetery are unknown and may affect availability Los Osos fault may be present Expansion plans for cemetery unknown
Giacomazzi	067-011-022	37.1	Rectangular parcel that slopes gently downward to the north and east toward an ephemeral drainage that extends along the easterly portion of the site to Warden Lake (offsite); collection of farm-related buildings along the western border; level areas have been cultivated with row crops (irrigation?); numerous tall trees around the buildings and in the drainage channel; useable portion of site is about 20 acres.	None; however, drainage channel conveys seasonal runoff	Close to LOVR, with level, unimproved road bordering on the east that intersects LOVR opposite Clark Valley Road No public water supply Electricity at LOVR?	Class III No LCA contract	Ephemeral drainage and surrounding sloping (uncultivated) areas support native and non-native grasses Numerous tall trees in channel and adjacent to buildings Drainage channel may support riparian species	Previously identified archaeological site (site 25) may extend onto this site	Soils are suitable for building No landslides Potential for Los Osos fault	Site is about one third mile from LOVR and partially visible to passing motorists Gently sloping terrain may help reduce apparent height /prominence of buildings	Cemetery is about one quarter mile to the south Residences on five-acre lots adjacent to the south and west Surrounding properties are ag operations	Useable portion of site is within one eighth mile of LOVR Site appears large enough to support some level of on-site disposal	No known easements or other restrictions	Effective size of the site (about 20 acres) is sufficient to accommodate a wide range of treatment technologies and on-site disposal Accessible from LOVR via intersection with Clark Valley Road No known private easement constraints Topography may allow for screening from LOVR Close to service area Less prime farm land, no LCA contract More removed from receptors and visibility from LOVR.	Ephemeral drainages may pose drainage issues with design and may support sensitive biological resources Archaeological resources may extend onto property from the south Los Osos fault may be present Requires access over intervening properties.

Table 5.21 Treatment Facility Site Alternatives – Advantages, Disadvantages and Issues

Property	APN	Acre-age	Description/ Topography	Flood Hazard	Access to Infrastructure	Agricultural Land	Biological Resources	Archaeological Resources	Hydro-Geology, Soils and Geologic Hazards	Visual Resources	Proximity of Sensitive Receptors	Proximity to Collection Area and Disposal Sites	Other Site-Specific factors	Advantages	Disadvantages
Andre 2	067-031-011	9.87	Narrow, triangular shaped parcel bordering LOVR; site slopes gently downward to the north; one small building; access provided from adjacent parcel in common ownership; one group of large trees that follows an ephemeral drainage that crosses the northerly portion of the site; useable area of site is about 9 acres, but narrow triangular shape limits development flexibility.	None; however, drainage channel conveys seasonal runoff	Borders LOVR, with level, unimproved road providing access from adjacent property to the west that intersects LOVR east of Clark Valley Road No public water supply Electricity at LOVR?	Class III No LCA contract	Site supports native and non-native grasses Ephemeral drainage contains numerous tall trees in channel	No known archaeological sites	Soils are suitable for building No landslides Potential for Los Osos fault	Site is adjacent to LOVR where the largest developable area is also located Would be highly visible to passing motorists Gently sloping terrain may help reduce apparent height /prominence of buildings, but site boundaries narrow to the north	Cemetery is about one quarter mile to the west Residences on five-acre lots are about one-half mile to the west and to the south Cluster ag-related buildings (including two residences) on properties to the east Church is located along LOVR about one-quarter mile to the west Surrounding properties are ag operations	Most useable portion of site is adjacent to LOVR Site appears too small and irregularly shaped to support on-site disposal	No known easements or other restrictions	Directly accessible from LOVR No known private easement constraints Topography may allow for screening from LOVR Slightly farther from service area but abuts LOVR Less prime farm land, no LCA contract More removed from receptors No known archaeological resources	Effective size (about 9 acres) and triangular shape may limit the types of treatment and/or disposal technologies. Useable portion of site is fairly visible from LOVR. Ephemeral drainage may support some habitat value. Vehicle speeds on LOVR are high in this area, which would likely require channelization (east-bound left turn lane, west-bound deceleration lane) for vehicle access.
Morosin /FEA	067-171-084	81.2	Irregularly shaped parcel located south of LOVR on the east side of Clark Valley Road at the base of the Irish Hills; southerly half of the site slopes upward into the foothills and is composed of native vegetation; northerly half of site is relatively flat and has been cultivated with row crops; site contains a church with parking and access road on a small knoll at the northerly border of the site; cluster of ag-related buildings located at the base of the foothills; water tank is located about 100 meters upslope from the ag buildings; useable area of site is about 35 acres.	None	Close to LOVR, with level, borders Clark Valley Road, which is a paved, two-lane county road No public water supply Electricity?	Class III on the northerly 35 acres Native soils and vegetation on the remainder No LCA contract on site Property adjacent to the west is governed by an LCA contract	Southerly (and un-buildable) portion of the site is composed of native vegetation which may support special status plant and animals species Cultivated area appears to have no habitat value No creeks or ephemeral drainages	No known archaeological sites	Soils on level portion of site are suitable for building No landslides Potential for Los Osos fault	Site borders Clark Valley Road which provides access to a small number of ranches and farms in the Clark Valley to the south Site is about one-half mile from LOVR and would be at least partially visible to passing motorists Intervening properties are mostly level and cultivated periodically with row crops	Church located on site Various farming /equestrian operations on surrounding properties of varying size Residences on five-acre site located about one mile to the west	Useable portion of site is within one half mile of LOVR Site appears large enough to support some level of on-site disposal	PG&E easement affects westerly 420 feet of site where buildings are prohibited Property immediately adjacent to the north is subject to a conservation easement	Effective size of the site (about 35 acres) is sufficient to accommodate a wide range of treatment technologies and on-site disposal Accessible from LOVR via intersection with Clark Valley Road Less visible from LOVR which may reduce need for screening Less prime farm land, no LCA contract More removed from receptors No known archaeological resources No flooding issues	Los Osos fault may be present Somewhat farther to service area than other sites Church and housing located on property Sensitive biological resources upslope to the south PG&E electrical transmission line easement affects the westerly 420 feet of site where buildings would not be allowed.

Table 5.21 Treatment Facility Site Alternatives – Advantages, Disadvantages and Issues

Property	APN	Acre-age	Description/ Topography	Flood Hazard	Access to Infrastructure	Agricultural Land	Biological Resources	Archaeological Resources	Hydro-Geology, Soils and Geologic Hazards	Visual Resources	Proximity of Sensitive Receptors	Proximity to Collection Area and Disposal Sites	Other Site-Specific factors	Advantages	Disadvantages
Branin	067-011-020	42.2	Irregularly shaped lot north of LOVR and adjacent to Warden Lake which consists of native wetland and riparian vegetation; site slopes to the north toward Warden lake and contains two ephemeral drainages; useable portion of the site appears to be periodically cultivated and consists of 15 - 25 acres.	Northerly third of site lies within the flood plain of Los Osos Creek /Warden Lake	Close to LOVR, but no apparent improved access No public water supply Electricity at LOVR?	Class III on the southerly 25 acres Native soils and wetland /riparian vegetation on the remainder No LCA contract on site	Northerly third of the site is composed of native vegetation which may support special status plant and animals species Cultivated area appears to have no habitat value Ephemeral drainages appear to have limited habitat	Previously identified archaeological site (site 13) extends onto this site	Soils on level portion of site are suitable for building May be potential for landslides on slopes leading down to Warden Lake Potential for Los Osos fault	Site is about two- thirds mile from LOVR and marginally visible to passing motorists Sloping terrain may help reduce apparent height /prominence of buildings	Cemetery is about two-thirds mile to the south Residences on five-acre lots located about two-thirds mile to the south and west Surrounding properties are ag operations	Useable portion of site is about two-thirds mile from LOVR, but appears to have no improved access Site appears large enough to support some level of on-site disposal	No known easements or other restrictions	Effective size of the site (about 15 - 25 acres) is sufficient to accommodate a wide range of treatment technologies and some on-site disposal Topography may allow for screening from LOVR Less prime farm land, no LCA contract More removed from receptors and visibility from LOVR	Ephemeral drainages may pose drainage issues with design and may support sensitive biological resources Site drains toward Warden lake, a tributary of Los Osos Creek Los Osos fault may be present Northerly portion of site (Warden Lake area) is subject to flooding Subject to agricultural preserve Requires access over intervening properties
Gorby	074-225-009	51.7	Irregularly-shaped lot located south of LOVR adjacent to the east side of Los Osos Creek; southerly half of the site slopes upward into the foothills of the Irish Hills and contains native vegetation; the north-westerly portion is level and contains a dwelling and equestrian facilities that include horse paddocks and riding areas. Several ornamental trees occupy the northwesterly portion of the site; level buildable portion of the site is triangular and consists of about 20 – 25 acres.	Site borders Los Osos Creek which is subject to periodic flooding in major storm events Buildable area appears to be outside the 100 year flood plain	Two lane dirt road provides access to LOVR opposite Lariat Drive No public water supply Electricity?	Class I on level area No LCA contract	Southerly (and un-buildable) portion of the site is composed of native vegetation which may support special status plant and animals species Los Osos Creek supports mature native riparian vegetation Equestrian area appears to have no habitat value	Numerous archaeological sites have been identified along Los Osos Creek which have been mapped to this property	Soils on level portion of site are suitable for building No landslides Ootential for Los Osos fault	Site is about two- thirds mile from LOVR and marginally visible to passing motorists Shape of lot and intervening vegetation may help reduce prominence of buildings	Dwellings on five-plus acre lots located immediately to the west of Los Osos Creek Mobile home park located within one-quarter mile to the northwest To the north are large-lot subdivisions with ag-related operations To the east is a church	Useable portion of site is about two-thirds mile from LOVR with access provided by unimproved road which also serves the intervening agricultural operations Site may be large enough to support some level of on-site disposal, including creek discharge	No known easements or other restrictions	Buildable area of the site (about 6 - 8 acres) is sufficient to accommodate some of the treatment technologies May be accessible from LOVR Less visible from LOVR	Los Osos fault may be present Los Osos creek is subject to flooding Buildable area is Class I agricultural land and subject to agricultural preserve unless currently developed area used (6 - 8 acres) Sensitive receptors to the west of creek Vehicle speeds on LOVR are high in this area, which would likely require channelization (west-bound left turn lane, east-bound deceleration lane) for vehicle access; Creek and upland area support sensitive biological resources Known unwilling seller

Table 5.21 Treatment Facility Site Alternatives – Advantages, Disadvantages and Issues

Property	APN	Acre-age	Description/ Topography	Flood Hazard	Access to Infrastructure	Agricultural Land	Biological Resources	Archaeological Resources	Hydro-Geology, Soils and Geologic Hazards	Visual Resources	Proximity of Sensitive Receptors	Proximity to Collection Area and Disposal Sites	Other Site-Specific factors	Advantages	Disadvantages
Robbins 1	067-031-037	41.1	Mostly rectangular-shaped lot abutting the north side of LOVR east of Clark Valley Road; site contains at least one dwelling and slopes to the north toward Warden Lake; large mature trees surround the farm buildings; site may be used for grazing; buildable portion of the site is about 30 acres.	Northerly portion of site lies within the flood plain of Warden Lake	Site abuts LOVR No public water supply Electricity?	Class III on the southerly 30 acres Native soils and wetland /riparian vegetation on the remainder No LCA contract on site	Northerly portion of the site is composed of native vegetation /wetlands which may support special status plant and animals species Fallow area appears to have limited habitat value	No known archaeological sites	Soils on level portion of site are suitable for building No landslides Potential for Los Osos fault	Site is adjacent to LOVR, and would be fairly visible to passing motorists Gently sloping terrain may help reduce apparent height /prominence of buildings	Cemetery and residences on five-acre lots are about one mile to the west One building (residence) on property to the east Church is located along south side of LOVR about one-half mile to the west Surrounding properties are ag operations	Site abuts LOVR and appears large enough to support some level of on-site disposal	No known easements or other restrictions	Effective size of the site (about 30 acres) is sufficient to accommodate a wide range of treatment technologies and on-site disposal Directly accessible from LOVR No known private easement constraints or archaeological resources Topography may allow for screening from LOVR Less prime farm land, no LCA contract More removed from receptors and visibility from LOVR	Site drains toward Warden lake, a tributary of Los Osos Creek Los Osos fault may be present Northerly portion of site (Warden lake area) is subject to flooding Vehicle speeds on LOVR are high in this area, which would likely require channelization (east-bound left turn lane, west-bound deceleration lane) for vehicle access Furthest property east of service area
Robbins 2	067-031-38	43.5	Mostly rectangular-shaped lot abutting the north side of LOVR east of Clark Valley Road; site slopes to the north toward Warden Lake; site may be used for grazing; buildable portion of the site is about 35 acres.	Northerly portion of site lies within the flood plain of Warden Lake	Site abuts LOVR No public water supply Electricity?	Class III on the southerly 35 acres; native soils and wetland/riparian vegetation on the remainder No LCA contract on site	Northerly portion of the site is composed of native vegetation /wetlands which may support special status plant and animals species Fallow area appears to have limited habitat value	No known archaeological sites	Soils on level portion of site are suitable for building No landslides Potential for Los Osos fault	Site is adjacent to LOVR, and would be fairly visible to passing motorists Gently sloping terrain may help reduce apparent height /prominence of buildings	Cemetery and residences on five-acre lots are about one mile to the west; at least two buildings (residences) on property to the east Church is located along south side of LOVR about one-half mile to the west Surrounding properties are ag operations	Site abuts LOVR and appears large enough to support some level of on-site disposal	No known easements or other restrictions	Effective size of the site (about 35 acres) is sufficient to accommodate a wide range of treatment technologies and on-site disposal Directly accessible from LOVR No known private easement constraints or archaeological resources Topography may allow for screening from LOVR Less prime farm land, no LCA contract More removed from receptors and visibility from LOVR	Less level than other sites; undulating topography. Site drains toward Warden lake, a tributary of Los Osos Creek Los Osos fault may be present Northerly portion of site (Warden lake area) is subject to flooding Vehicle speeds on LOVR are high in this area, which would likely require channelization (east-bound left turn lane, west-bound deceleration lane) for vehicle access Second furthest property east of service area

Table 5.21 Treatment Facility Site Alternatives – Advantages, Disadvantages and Issues

Property	APN	Acre-age	Description/ Topography	Flood Hazard	Access to Infrastructure	Agricultural Land	Biological Resources	Archaeological Resources	Hydro-Geology, Soils and Geologic Hazards	Visual Resources	Proximity of Sensitive Receptors	Proximity to Collection Area and Disposal Sites	Other Site-Specific factors	Advantages	Disadvantages
Tonini Ranch	067-031-001	645	Irregular shaped ranch land bounded by the north and east by Turri Road; located north of LOVR approximately 2 miles from the urban area; northwesterly portion of the site consists of steeply sloped hills and ravines with native vegetation. southeasterly portion of the site consists of range land and cultivated farm land; existing historic ranch house and out-building near center of parcel. buildable area is approximately 100 acres.	None; however, drainage channel conveys seasonal runoff	Site abuts Turri Road No public water supply Electricity?	Class II irrigated on approximately 100 acres. Williamson Act Contract	Northwesterly portions of the site are composed of native vegetation which may support special status plant and animals species Cultivated area appears to have no habitat value Ephemeral drainages appear to have limited habitat	Archaeological sites identified	Soils are suitable for building No landslides Potential for Los Osos fault	Site is close to Turri Road and visible to passing motorists; is distant from LOVR with limited visual impact Gently sloping terrain may help reduce apparent height /prominence of buildings	Surrounding properties are ag operations	Useable portion of site is approximately 2 miles from service area of LOVR Site is large enough to support large amount of on-site disposal	No known easements or other restrictions in potential building areas	Effective size of the site (over 100 acres) is sufficient to accommodate a wide range of treatment technologies and on-site disposal Distance from neighbors and sensitive receptors Accessible from LOVR via Turri Road No apparent habitat value or known private easement constraints in potential building areas. Topography and distance allows for screening from LOVR No potential for flooding.	Archaeological resources on property Furthest distance from service area Prime farm land, and LCA contract Located in scenic viewshed of Turri Road.
Mid-Town (aka Tri-W)	074-229-017	11 +	This site was rough graded for the treatment plant and drainage basin. It generally sloped gently south to north.	None; however, drainage channel conveys seasonal runoff and will require a large drainage basin.	The site is served by water, gas and electricity. The plant would require additional electrical capacity be brought to the site for operation.	Not designated agriculture.	Part of the highly sensitive Los Osos dune sands, home to the endangered Morro shoulderband snail, and several other sensitive species. Many snails were removed from the site during initial construction of the project. Habitat for the snail would easily return given the nature of the sandy soils.	Previously cleared for archaeological resources	Shallow groundwater table (although this varies because of slope); Soils and slopes suitable for construction; Proximate to presumed Strand B of Los Osos fault (disputed by Cleath & Associates)	The site is in town, and adjacent to the heavily traveled LOVR. Views of Morro Rock would be obscured by the treatment facilities. CCC report said net impact was beneficial because views to Morro Rock were opened up.	This site is proximate on three sides to developed land. Residential to the south and west, community facilities to the east. Three churches are nearby.	This site is central to the collection system. Because it lies within the area of collection, it is as efficient a location as would likely be found (i.e. no great advantage to any other site in town). It is as close to the Broderson disposal site as possible without going up the hill to the south.	The site is under the ownership of the LOCSD. Because of previous design, permitting and litigation efforts, it may have a considerably shorter time required to begin construction. Tri-W requires mitigation for ESHA loss.	Accessible from LOVR No known private easement constraints Located in center of service area Previously purchased, permitted and graded for LOCSD project	Effective size of the site (about 10 acres) limits treatment technologies to MBR process Adjacent to receptors and directly visible from LOVR. Part of the highly sensitive Los Osos dune sands, home to the endangered Morro shoulderband snail, and several other sensitive species Significant drainage area requires drainage basin

CHAPTER 6:SELECTION OF AN ALTERNATIVE

6.1. INTRODUCTION

The alternatives evaluation process described in Chapter 5, above, includes extensive review of both monetary and non-monetary factors. The evaluation includes engineering feasibility and cost evaluations of a broad range of alternatives, a co-equal environmental analysis, public outreach and input, including a community-wide survey on alternatives, and a formal, public decision making process at the County Planning Commission and Board of Supervisors.

6.2. PRESENT WORTH COST ANALYSIS

The life cycle cost evaluations completed for the engineering review are detailed in the Fine Screening Report and the project Technical Memoranda, with summaries of the cost estimates presented in Section 5.11, above. These estimates cost are the basis for the present worth cost analysis in Table 6.1 through Table 6.6. The "real" federal discount rate of 2.7% was used from Appendix C of OMB Circular A-94 to determine the present worth of operations and maintenance costs for a 30-year life. The operations and maintenance cost estimates include consideration of periodic replacement of short-lived assets.

Table 6.1 Collection System Alternatives Present Worth ($ Million)

	Capital		O&M		O&M -- PV		Total -- PV	
	Low	High	Low	High	Low	High	Low	High
Gravity	82.2	89.6	0.48	0.48	9.78	9.78	$92.0	$99.4
Low Pressure Grinder Pump	75.6	96.9	1.50	2.00	30.57	40.77	$106.2	$137.7
STEP/STEG	65.0	81.4	0.79	0.79	16.10	16.10	$81.1	$97.5

The apparent low cost collection system alternatives are gravity or STEP/STEG.

Table 6.2 Solids Handling Alternatives Present Worth ($ Million) (with belt filter press and no outdoor solar drying)

	Capital		O&M		O&M -- PV		Total -- PV	
	Low	High	Low	High	Low	High	Low	High
with Gravity Collection								
Fac Ponds w/Gravity	0.0	0.0	0.04	0.05	0.82	1.02	$0.8	$1.0
Sub-Class B w/Gravity	2.6	3.3	0.63	0.66	12.84	13.45	$15.4	$16.8
Digested Class B w/Gravity	5.3	6.0	0.63	0.66	12.84	13.45	$18.1	$19.5
Heat Dried Class B w/Gravity	5.5	6.2	0.60	0.62	12.23	12.64	$17.7	$18.8
Compost Class B w/Gravity	3.6	4.3	0.68	0.71	13.86	14.47	$17.5	$18.8
Compost Class A w/Gravity	3.6	4.3	0.62	0.65	12.64	13.25	$16.2	$17.5
Digest/Compost Class A w/Gravity	6.3	7.0	0.63	0.66	12.84	13.45	$19.1	$20.5
with STEP/STEG Collection								
Fac Ponds w/STEP	0.0	0.0	0.03	0.04	0.61	0.82	$0.6	$0.8
Sub-Class B w/STEP	1.4	2.4	0.28	0.38	5.71	7.75	$7.1	$10.1
Digested Class B w/STEP	2.8	4.2	0.28	0.38	5.71	7.75	$8.5	$11.9
Heat Dried Class B w/STEP	3.0	4.4	0.30	0.42	6.11	8.56	$9.1	$13.0
Compost Class B w/STEP	1.9	3.2	0.35	0.48	7.13	9.78	$9.0	$13.0
Compost Class A w/STEP	1.9	3.2	0.33	0.46	6.73	9.38	$8.6	$12.6
Digest/Compost Class A w/STEP	3.3	5.0	0.33	0.46	6.73	9.38	$10.0	$14.4

The apparent low cost solids handling alternative for extended aeration processes is hauling sub-Class B biosolids for off-site disposal.

Table 6.3 Treatment Process Alternatives Present Worth ($ Million) (with denitrification and tertiary recycled water)

	Capital	O&M	O&M -- PV	Total -- PV
with Gravity Collection				
MLE w/Gravity	25.7	0.80	16.31	$42.0
BIOLAC w/Gravity	20.7	0.80	16.31	$37.0
SBR w/Gravity	26.5	0.76	15.49	$42.0
Ox Ditch w/Gravity	23.1	0.79	16.10	$39.2
Trickling Filter w/Gravity	31.4	1.11	22.62	$54.0
Fac Ponds w/Gravity	26.1	0.98	19.98	$46.1
MBR w/Gravity	55.0	0.74	15.08	$70.1
with STEP/STEG Collection				
MLE w/STEP	26.2	0.92	18.75	$45.0
BIOLAC w/STEP	21.3	0.90	18.34	$39.6
SBR w/STEP	26.5	0.94	19.16	$45.7
Ox Ditch w/STEP	23.6	0.92	18.75	$42.4
Trickling Filter w/STEP	28.0	1.05	21.40	$49.4
Fac Ponds w/STEP	24.6	0.98	19.98	$44.6
MBR w/STEP	58.6	0.99	20.18	$78.8

The apparent low cost treatment alternative when considering solids handling is Facultative Ponds. Next low cost alternatives are BIOLAC and Oxidation Ditch.

Table 6.4 Effluent Reuse and Disposal Alternatives Present Worth ($ Millions)								
Individual reuse and disposal components								
	Capital		O&M		O&M -- PV		Total -- PV	
	Low	High	Low	High	Low	High	Low	High
Conservation Program	1.0	5.0	0.00	0.00	0.00	0.00	$1.0	$5.0
Storage Ponds (30 – 290 af)	0.400	3.900	0.00	0.00	0.00	0.00	$0.4	$3.9
Sprayfields								
Sprayfield Piping	1.210	1.650						
Sprayfield Development	0.020	0.080						
Maintenance Equipment	0.700	2.800						
Land Acquisition	1.800	7.000						
Total Sprayfields	3.730	11.530	0.07	0.28	1.37	5.63	$5.1	$17.2
Broderson Leachfields								
Recycled Water Return Main	2.200	2.900						
Recycled Water Pump Station	0.780	1.500						
Leachfield Development	2.367	2.367						
Total Leachfields	5.347	6.767	0.25	0.26	5.10	5.30	$10.4	$12.1
Urban and Ag Reuse								
Recycled Water Turn Outs	1.400	2.100						
Recycled Water Return Main	Incl w/ Broderson							
Recycled Water Pump Station	Incl w/ Broderson							
Total Urban and Ag Reuse	1.400	2.100	0.03	0.04	0.69	0.90	$2.1	$3.0
Draft EIR Environmentally Superior Alternative ($1M conservation program, sprayfields and Broderson leachfields)								
Conservation Program	1.0	1.0	0.00	0.00	0.00	0.00	$1.0	$1.0
Sprayfields (180 acres)	9.70	10.50	0.07	0.28	1.37	5.63	$11.1	$16.1
Spray Storage Ponds (50 af)	0.67	0.87	0.00	0.00	0.00	0.00	$0.7	$0.9
Broderson Leachfields	5.35	6.77	0.25	0.26	5.10	5.30	$10.4	$12.1
VPA 2b Total	$16.7	$19.1	$0.3	$0.5	$6.5	$10.9	$23.2	$30.1
Coastal Development Permit Conditioned Alternative ($5M conservation program, Broderson leachfields, urban and ag reuse)								
Conservation Program	5.0	5.0	0.00	0.00	0.00	0.00	$5.0	$5.0
Urban and Ag Reuse	1.40	2.10	0.03	0.04	0.69	0.90	$2.1	$3.0
Recycled Water Storage (50 af)	0.67	0.87	0.00	0.00	0.00	0.00	$0.7	$0.9
Broderson Leachfields	5.35	6.77	0.25	0.26	5.10	5.30	$10.4	$12.1
CDP Alternative Total	$12.4	$14.7	$0.284	$0.304	$5.8	$6.2	$18.2	$20.9

The apparent low cost combination of effluent reuse and disposal alternatives is the Coastal Development Permit conditioned alternative.

Table 6.5 Project Soft Costs Present Worth ($ Million)

	Capital PV	
	Low	High
Treatment Site Land Acquisition	$1.0	$3.0
Env. Permitting/Mitigation	$1.0	$2.0
Project Costs		
Administration and Environmental Reports	$5.0	$7.0
Design – Gravity Collection System	$2.5	$3.0
Design – STEP/STEG Collection System	$4.5	$6.0
Design – Treatment Facility	$2.5	$3.0
Construction Engineering	$6.0	$8.0
Project Soft Costs w/Gravity	$18.0	$26.0
Project Soft Costs w/STEP/STEG	$20.0	$29.0

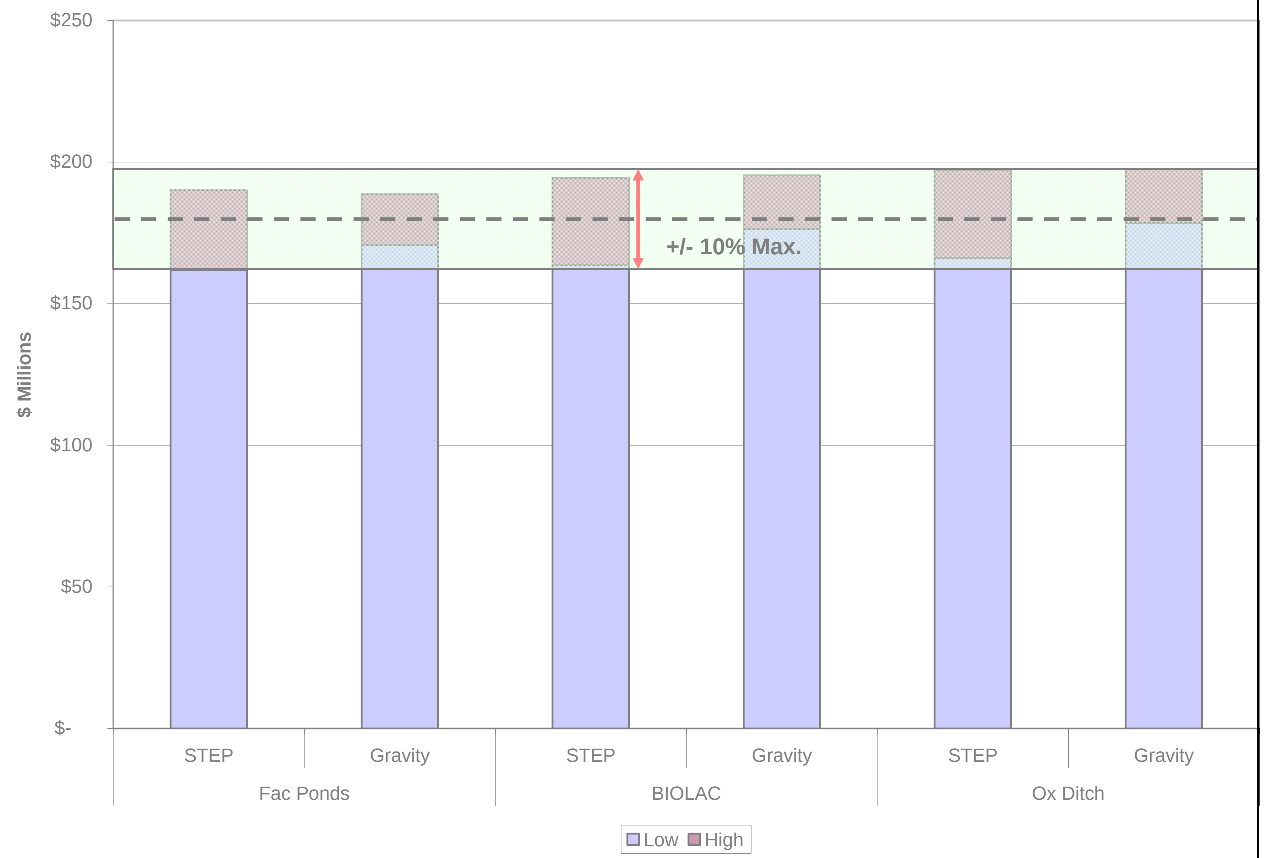
Table 6.6 Present Worth Comparison for Project Combinations of Apparent Low Cost Alternatives ($ Million)

	Collection		Treatment		Solids		Effluent		Soft Costs		Total -- PV	
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
with Gravity Collection												
Facultative Ponds	92.0	99.4	46.1	46.1	0.8	1.0	18.2	20.9	18.0	26.0	$175.1	$193.4
BIOLAC	92.0	99.4	37.0	37.0	15.4	16.8	18.2	20.9	18.0	26.0	$180.6	$200.1
Ox Ditch	92.0	99.4	39.2	39.2	15.4	16.8	18.2	20.9	18.0	26.0	$182.8	$202.3
with STEP/STEG Collection												
Facultative Ponds	81.1	97.5	44.6	44.6	0.6	0.8	18.2	20.9	20.0	29.0	$164.5	$192.8
BIOLAC	81.1	97.5	39.6	39.6	7.1	10.1	18.2	20.9	20.0	29.0	$166.1	$197.2
Ox Ditch	81.1	97.5	42.4	42.4	7.1	10.1	18.2	20.9	20.0	29.0	$168.8	$199.9

Comparison of the present worth for several project combinations of the apparent low cost alternatives for the collection system (gravity or STEP/STEG) and treatment process (facultative ponds, BIOLAC, or oxidation ditch) demonstrates a close variance in cost estimates of +/-10% of the total estimated project cost. The variance is within the range of uncertainty for the high and low estimates of project costs and the range for each combination overlaps the ranges of the other combinations (see Figure 6.1, below).

Due to the close range of cost estimates for several viable project alternatives, non-monetary factors are also a consideration in selection of alternatives for the collection system and treatment process.

Figure 6.1 Present Worth Comparison for Apparent Low Cost Alternatives



6.3. NON-MONETARY FACTORS CONSIDERED

Multiple technology alternatives for the project are within a relative close life-cycle costs range. The ability to interchange collection system and treatment process alternatives results in a wide range of project combinations that are economically feasible. There are, however, non-monetary factors that make some options infeasible and provide direction in selecting an alternative between multiple feasible options.

a. <u>Treatment Facility Site</u>: The environmental review process included a broad range of potential treatment facility sites. The two most feasible site alternatives, Giacomazzi and Tonini, were co-equally analyzed in the project EIR. The formal decision making process at the County Planning Commission and Board of Supervisors further considered the potential environmental effects of each alternative. Major factors considered in the deliberations include agricultural impacts, visual impacts, and potential for water resources benefits. The decision making process resulted in the selection of the Giacomazzi site alternative and prohibited any development at the Tonini site.

b. Effluent Reuse and Disposal: No one alternative has the capacity to meet all of the project needs for effluent reuse or disposal, so several combinations of alternatives were considered in the engineering and environmental review process. The project EIR co-equally analyzed several alternatives, and the formal decision making process at the County Planning Commission and Board of Supervisors further considered the potential environmental effects of each alternative. The project was ultimately conditioned to provide tertiary treatment to produce CA Title 22 Recycled Water and to develop a recycled water reuse program that will have the greatest beneficial effect on the basin, measured by the mitigation of sea water intrusion. The reuse program includes the Broderson and Bayridge Estates leachfields and urban and agricultural irrigation reuse. The project also include 50 acre-feet of recycled water storage on approximately 10 acres of the Giacomazzi site. Disposal alternatives and irrigation outside the limits of the groundwater basin are prohibited.

c. Collection System: Life-cycle cost estimates for gravity and STEP/STEG collection system overlap, and fall within the level of uncertainty of the engineering cost estimate. Recommendation of a gravity collection system included consideration of the following non-monetary factors.

- Environmental analysis: Gravity collection system is the environmentally superior alternative with a significantly reduced greenhouse gas impact and better ability to avoid sensitive archeological areas during construction.
- Existing design level: A full design of the gravity collection system was completed, with bids received and construction underway, under the LOCSD project. The existing design level provides a high level of confidence in cost estimates and the feasibility of a gravity system. The STEP/STEG system has only been developed to a conceptual plan level. The cost estimates have a higher degree of uncertainty and certain design issues are unresolved, such as whether pump stations will be required. The feasibility of locating and installation of new septic tanks on each individual parcel, some with limited access, is unknown.
- Schedule considerations: The existing gravity design can be quickly implement by soliciting construction bids after minimal revisions to the bidding documents. Preparation of a STEP/STEG design would likely add one or more years to the project schedule. There are risks of further delay if property owners who oppose placing septic tanks on their properties raise legal challenges or if it is infeasible to locate septic tanks on a large number of properties.
- Cost escalation: Additional design costs and project delays associated with developing a STEP/STEG design can potentially escalate project costs beyond the currently estimated range, which is comparable to a gravity alternative.
- Individual property impacts: A STEP/STEG system would disproportionately impact some property owners connection costs. The estimated average cost for homeowners to complete on-lot connection work is between $2,500 and

$7,500. However, individual property owners would likely have costs well over $10,000, in addition to the project costs charged by the County.

- Overall property impacts: A STEP/STEG system is expected to have less construction impacts in the roadways, with far more impacts on private property. This alternative would disproportionately shift impacts of a public infrastructure project from the public roadway, where impacts are better able to be mitigated, to private property.
- Community survey results: The Community Advisory Survey, which was conducted in February, 2009, asked property owners and residents which collection system alternative was preferred. An overwhelming 70% preferred a gravity system, even when potential cost savings of a STEP/STEG system were considered.

d. <u>Treatment Process</u>: Life-cycle cost estimates for facultative ponds and for both extended aeration processes (Biolac and oxidation ditch) overlap, and fall within the level of uncertainty of the engineering cost estimate. The project EIR considered the extended aeration processes as equivalent and completed a co-equal analysis of extended aeration and facultative ponds. The formal decision making process at the County Planning Commission and Board of Supervisors further considered the potential environmental effects of each alternative and effectively eliminated the facultative pond alternative. The approved project allows either extended aeration process. For the purpose of analysis in this report, an oxidation ditch is assumed as a likely alternative to be constructed based on the following non-monetary factors.

- Site constraints: The selection of the Giacomazzi site limits the treatment facility to less than 15 acres after accounting for the recycled water storage ponds and the required setbacks from sensitive resources. Site constraints make facultative ponds infeasible at the Giacomazzi site. A Biolac is feasible on this site, however the smaller footprint of an oxidation ditch increases constructability and flexibility to meet future needs.
- Greenhouse gas impacts: Biolac and oxidation ditch process have similar greenhouse gas impacts. Facultative ponds have the greatest impact of the three alternatives at 33% greater than Biolac.
- Effluent total nitrogen limits: The project is expected to have Waste Discharge Requirements with a stringent total nitrogen limit of 7 mg/L. Both extended aeration processes have proven records of consistently meeting this level of denitrification. Facultative ponds are not expected to be able to meet the requirement without additional treatment processes added. This extra level of operational complexity with facultative ponds increases the chance of non-compliance with regulatory discharge requirements.
- Operational reliability: Facultative ponds may have other reliability compliance issues, in addition to meeting a total nitrogen limit of 7 mg/L. Seasonal variations can lead to increased suspended solids levels or algae problems and upset of thermal layers in the ponds can cause significant odor incidents. Biolac and oxidation ditch are relatively similar in reliability,

however the blower and diffuser system with Biolac is a potential maintenance issue not present with an oxidation ditch. Several municipal oxidation ditches of similar capacity are already in operation or planned in San Luis Obispo County, increasing the ability to recruit operators familiar with the process.

- Construction costs: The aeration basins with Biolac are constructed as lined earth ponds, compared to reinforced concrete with an oxidation ditch. At this time, cost estimates for the two processes are relatively close and are outweighed by non-monetary factors. Market volatility for construction materials must be monitored as the project moves toward the design phase to confirm the preliminary cost estimates.

e. Biosolids Handling: Hauling sub-Class B biosolids to a local disposal or recycling facility is the lowest life-cycle cost alternative and is recommended for the project. The current regulatory and economic climate is favorable for this alternative, and the option for further treatment is not precluded from being added at some future date, if regulations change. The facilities required for this alternative are a biosolids storage tank, a thickening process, a mechanical dewatering process, and loading station. All of these facilities would likely be used as part of a digesting or composting process to produce classified biosolids, if required in the future.

CHAPTER 7:PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)

7.1. INTRODUCTION

The recommended alternative is the project description approved by the County Planning Commission and Board of Supervisors in 2009 through the formal environmental review process. The approved project is a combination of the many alternatives evaluated in the engineering and environmental review processes. The project consists of a gravity collection system for the entire service area, extended aeration secondary treatment process with tertiary filtration and disinfection at the Giacomazzi site, sanitary disposal of dewatered biosolids, and recycled water reuse program through sub-surface leachfields and unrestricted irrigation.

7.2. PROJECT DESIGN

a. Collection System Layout and Pumping Stations: A full collection system design was completed by the Los Osos CSD in 2004, prior to their cessation of the project and the passage of AB 2701. This design is largely the basis for the proposed project, with the exception of changes required to convey wastewater to a new treatment plant site at the eastern edge of the community. These changes consist of an additional pumping station at the Mid-Town site and a force main from this site to the treatment facility. Collection system and pumping station details are provided in Table 7.1, below. The layout of the collection system and pumping stations is provided in Figure 5.1 (Project Diagram).

b. Treatment Facility: The treatment facility will be located at the Giacomazzi site, on the eastern edge of the community. The site is 38 acres, with approximately 30 acres of useable area after avoidance and buffers for sensitive resources. The site will contain all treatment and related facilities including administration and maintenance buildings, solids processing, storm water and emergency overflow retention, recycled water storage ponds, and recycled water pump station.

   The treatment facility will be design for an average daily flow of 1.2 MGD and will consist of the following:

   - Headworks and bar screens covered for odor control
   - Extended aeration secondary treatment process (oxidation ditch assumed) designed to meet total nitrogen limit of 7 mg/L
   - Secondary clarifiers
   - Return/waste activated sludge pump station
   - Tertiary filtration with ultraviolet disinfection designed to meet California Title 22 standards for tertiary recycled water
   - Mechanical sludge dewatering (belt filter press or screw press) enclosed in a building for odor control
   - Recycled water storage ponds and pump station

The layout of the treatment facility and recycled water storage ponds is provided in Figure 7.1. Architectural renderings of the proposed building design are provided in Figure 7.2 and Figure 7.3.

Table 7.1 Collection System Information

Pipelines				
Pipe Diameter	**Depth: 0-8 ft**	**Depth: 9-12 ft**	**Depth: 13-15 ft**	**Depth: 16-18 ft**
8-inch	159,256 ft	45,849 ft	2,240 ft	80 ft
10-inch	0	1,190 ft	1,300 ft	0
12-inch	0	2,413 ft	654 ft	654 ft
15-inch	0	3,561 ft	709 ft	0
18-inch	0	860 ft	600 ft	0
Pump Stations				
Name & Type	**Location**	**Peak Hour Wet Weather Flowrate (gpm)**	**Pump HP (each)**	**Stand-by Power**
Mid-Town Triplex	LOVR & Palisades	2,800	75	Yes, remote location
West Paso Triplex	3rd & Paso Robles Ave.	1,900	60	Yes, remote location
Lupine Triplex	Lupine & Donna	1,000	30	Yes
Baywood Duplex	2nd St.	310	5	Yes, remote location
East Ysabel Duplex	Santa Ysabel & So. Bay Blvd	170	10	Yes
East Paso Duplex	18th & Paso Robles Ave.	330	8	Yes
Mountain View Duplex	Santa Ynez & Mt. View	130	5	Yes
Solano Duplex	Solano & Butte	240	20	Yes
Sunny Oaks Duplex	LOVR @ Sunny Oaks	120	3	Yes
Pocket PS (13 each)	Various	7 – 34	1	No (2 – 7 hours storage)

Figure 7.1 Treatment Facility Layout

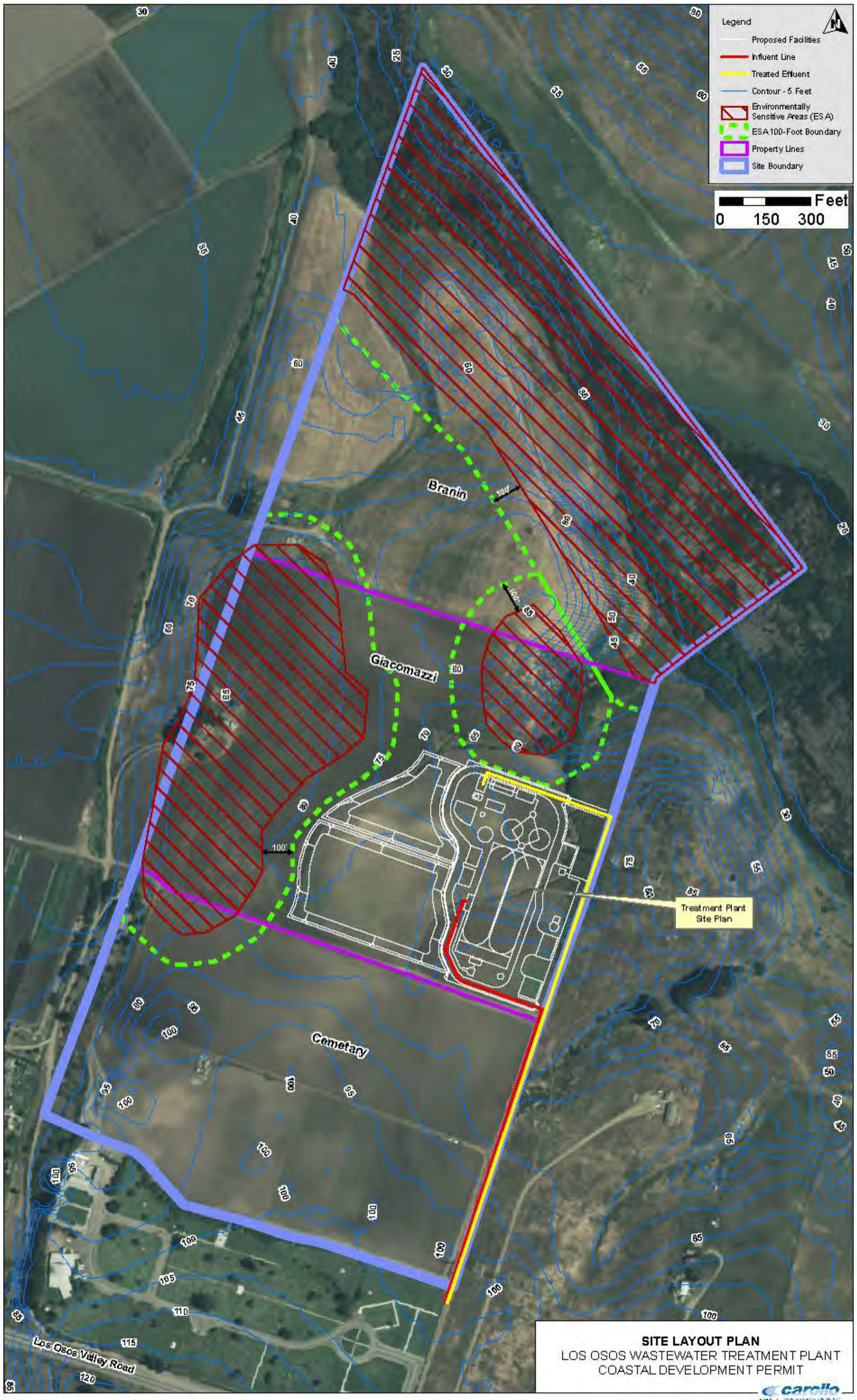


Figure 7.2 Treatment Facility Administration Building Architectural Rendering

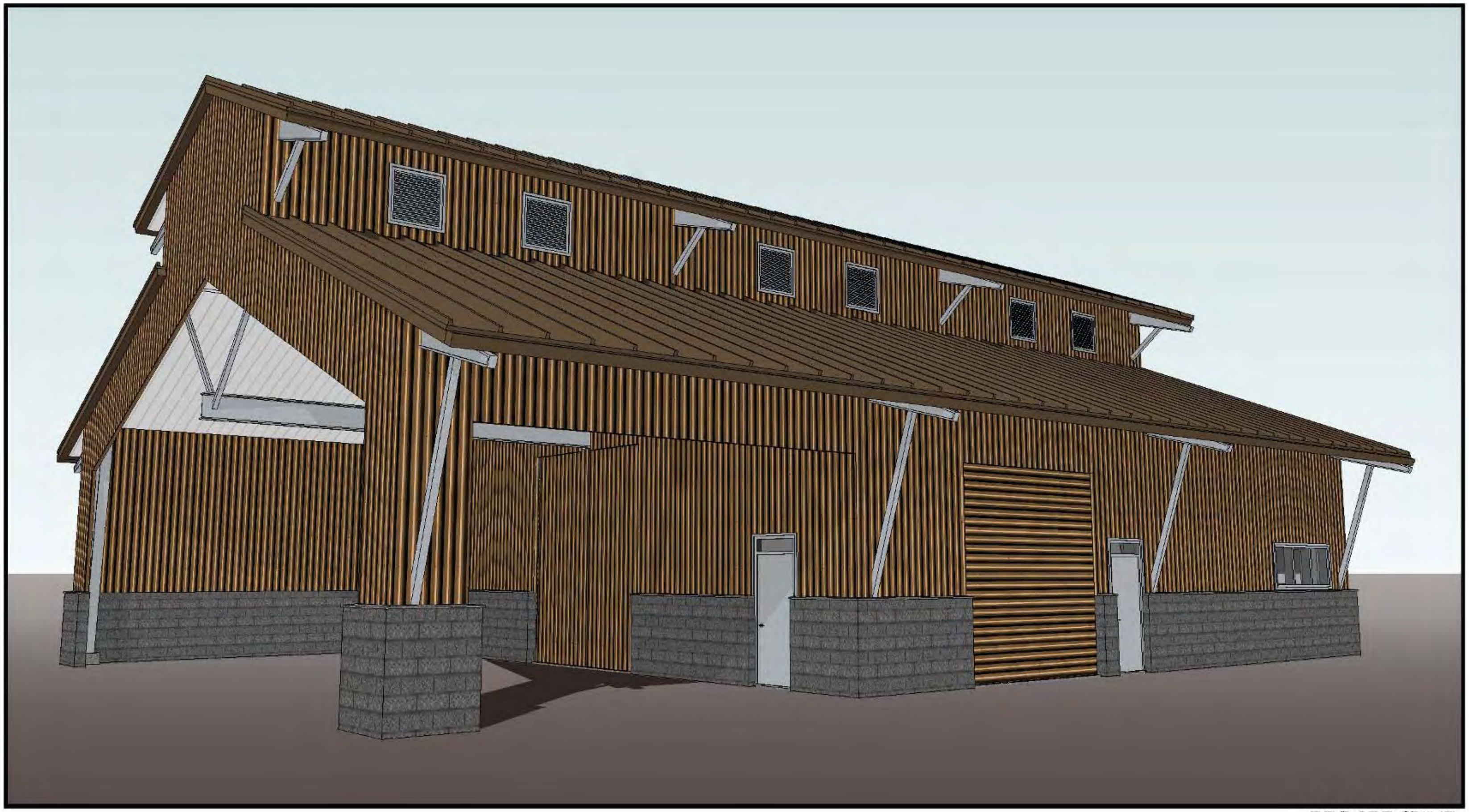
PERSPECTIVE

LOS OSOS WASTEWATER TREATMENT FACILITY
ADMINISRATION BUILDING

STEVEN D. PULTS & ASSOCIATES, LLC
SAN LUIS OBISPO, CA

COUNTY OF
SAN LUIS OBISPO, CA

Figure 7.3 Treatment Facility Maintenance Building Architectural Rendering



PERSPECTIVE

LOS OSOS WASTEWATER TREATMENT FACILITY

MAINTENANCE BUILDING

STEVEN D. PULTS & ASSOCIATES, LLC
SAN LUIS OBISPO, CA

COUNTY OF
SAN LUIS OBISPO, CA

c. Recycled Water Reuse: Recycled wastewater will be reused within the community or surrounding agricultural land overlying the groundwater basin according the approved conditions of the Coastal Development Permit. It will either be discharged through leachfields or directly reused for urban or agricultural irrigation. The reuse program will consist of the following:

- 50 acre-feet of storage at the treatment plant site
- A recycled water main running from the treatment plant site, through the adjacent agricultural area, to reuse sites within the community
- 8 acres of leachfields at the Broderson site, with an annual capacity of 450 acre-feet
- Utilize one acre of existing leachfieds in the Bayridge Estates sub-division with an annual capacity of 33 acre-feet
- Provide approximately 130 acre-feet of recycled water to Los Osos schools, parks, golf course, and cemetery
- Provide recycled water main turn-outs to adjacent farmlands and develop reuse agreements for approximately 100 to 200 acre-feet per year

The approved reuse program includes capacity to meet the flows from existing development that will connect to the system at project start-up. Connection of additional users, from currently undeveloped property, is specifically prohibited in the Coastal Development Permit, until certain conditions are met. These conditions include the requirement to develop a habitat conservation plan for Los Osos, develop a water management plan, and update the Local Coastal Plan to incorporate the habitat and water plans. Reuse capacity for the additional flows associated with new development is not necessary at project start-up, due to these conditions. The Coastal permit conditions effectively require a water management plan to identify the most beneficial reuse alternatives for the additional flows associated with new development, prior to any new connections to the system. The layout of the recycled water reuse sites is provided in Figure 5.1 (Project Diagram).

d. Water Conservation Program: A water conservation program will be implemented with residential and commercial fixture retrofits, appliance rebates, education, and water efficiency audits. The goal of the conservation program is to reduce indoor use by over 25% to 50 gallons per capita per day. The water conservation program will result in decreased demand on system facilities such as pump stations and treatment works, increase the operating life of the facilities, and increase operational flexibility.

7.3. TOTAL PROJECT COST ESTIMATE

Cost estimates for individual components are presented in Section 5.11. Total project cost estimate for the proposed project is summarized below. The total capital project cost expected to be financed with a combination of USDA and State Revolving Fund (SRF) financing is estimated at $173.5 M, which includes anticipated finance charges and excludes homeowner financed on-lot costs.

Table 7.2 Total Project Capital Cost Estimate

	Average Estimate ($ M)	Notes
Collection System		1
Mobilization/Demobilization	$3.9	
Gravity Sewers and Force Mains	$29.2	
Manholes	$4.5	
Shoring and Dewatering	$5.1	
Duplex Pump Stations	$2.6	
Triplex Pump Stations	$1.2	
Pocket Pump Stations	$2.4	
Standby Power Facilities	$2.5	
Misc. Facilities	$3.3	
Laterals in Right-of-Way	$9.3	
Road Restoration	$5.2	
Homeowner On-Lot Facilities	$13.3	2
Out-of-Town Conveyance	$3.4	3
Total Collection System	**$85.7**	
Treatment Process		
Secondary Process	$19.6	4
Tertiary Filtration/Disinfection	$3.5	5
Total Treatment Process	**$23.1**	
Solids Processing		
Thickening	$1.0	6
Mechanical Dewatering	$2.0	7
Total Solids Processing	**$3.0**	
Recycled Water Reuse		
Water Conservation Program	$0.0	8
Broderson Pipe and Leachfield	$6.1	
Recycled Water Turn-outs	$1.8	9
Recycled Water Storage (50 af)	$0.8	
Total Recycled Water Reuse	$8.6	
Sub-Total Construction	**$120.3**	
10% Construction Contingency	$10.7	10
Total Construction Costs	$131.0	
Cost Escalation (18.0%) to Mid-Point of Construction	$23.6	11

Table 7.2 Total Project Capital Cost Estimate		
	Average Estimate ($ M)	**Notes**
Project Soft Costs		
Water Conservation Program	$5.0	12
Admin/Environmental Reports	$6.0	
Land - Treatment Site	$2.0	
Environmental Permits/Mitigation	$1.5	
Design-Collection System	$2.7	
Design-Treatment Facility	$2.8	
Construction Management	$7.0	
Total Project Soft Costs	**$27.0**	
Total Project Costs	**$181.6**	13
Financing Costs		
Conditioned Repayment of LOSCD Default on SRF Loan	$6.5	
Interest and Issuance Charges – Interim Financing	$1.0	
Total Capital Project Costs	**$189.1**	13

(1) Collection System estimates from Fine Screening Report (FSR), Table 3.17, except as noted.
(2) Homeowner On-Lot Facilities not eligible for project financing; owner financed.
(3) Conveyance estimate from Conveyance Tech Memo, Table 7, with no micro-tunneling.
(4) Secondary treatment estimate from FSR, Tables 4.9 & 4.19.
(5) Tertiary treatment estimate from FSR, Section 4.8 for full flow.
(6) Thickening estimate from FSR, Table 5.3.
(7) Dewatering estimate from FSR, Table 5.5.
(8) Included in Project Soft Costs; no escalation on Water Conservation Program.
(9) Average of range for estimated 10,000 to 15,000 linear feet of recycled water pipeline at $143/lf.
(10) Assume 10% construction contingency, less Homeowner On-Lot Facilities.
(11) FSR, Appendix C estimated construction cost escalation at 5%, per year, from April 2007 to June 2011, the estimated mid-point of construction. The estimated construction cost escalation has been revised to reflect recent economic developments and project delays. The Engineering News Report Construction Cost Index 20-Cities Average for February, 2010 is 8671 (10.05% increase over April, 2007). Adding an assumed 3% annual escalation from February, 2010 to an assumed mid-point of construction in June, 2012, the total escalation is 18.0%.
(12) Water Conservation Program budget of $5 M required per project Coastal Development Permit conditions.
(13) Includes $15.6 M ($13.3 M + 18% escalation) for Homeowner On-Lot Facilities.

7.4. ANNUAL OPERATION BUDGET

The proposed project will provide wastewater collection and treatment services to a community that is entirely on septic systems. The development and operation of this major infrastructure project will require a variety of funding sources. In October, 2007, property assessments were established for currently developed properties that are equivalent to $24,941 per single family dwelling unit for a total of $126,722,296. Additional assessments for vacant properties are planned, subject to a second assessment vote under California Proposition 218. The assessment district for undeveloped properties will follow the same formula as for developed properties and provide an additional $27,721,704. The total property assessments of $154,444,000 will fund capital project costs that are considered “special benefits” under California assessment law. Other capital project costs which are not considered “special benefits” total approximately $12 million, plus homeowner financed on-lot facilities. The income for these non-special benefit capital costs, operations and maintenance costs, and reserve funds will be developed through user charges.

a. Income – Total Revenue Requirements and Estimated Charges per EDU: The total annual revenue requirements for debt service, reserves, and O&M costs are allocated between property assessments and user charges. Property assessment charges are assumed to be charged to all developed and undeveloped property in the assessment district. User charges are assumed to be charged only to currently developed property within the service area. All USDA financing is assumed to be allocated to the assessment charges. The SRF loan program will finance the remaining capital costs, which will be repaid through a combination of property assessments and user charges. All short-lived asset reserves and O&M costs are allocated to user charges.

Table 7.3 Estimated Total Revenue Requirements

Category	**Total Annual Costs**	**Allocated to Assessments**	**Allocated to User Charges**
Debt Service (USDA Loan)	$4,179,165	$4,179,165	$0
Debt Service Reserve (USDA Loan)	$0	$0	$0
Debt Service (SRF)	$6,284,669	$5,003,806	$1,280,863
Debt Service Reserve (SRF)	$128,086	$0	$128,086
Short-Lived Asset Reserve	$200,000	$0	$200,000
O&M	$2,370,000	$0	$2,370,000
Annual Revenue Required	$13,161,920	$9,182,971	$3,978,949

Table 7.4 Example Total Monthly Costs by User Group

Example User Group	Assessment Charge Per Unit	User Charge Per Unit	On-Lot Costs Per Unit	Total Costs Per Unit
Single Family Residence	$123.58	$60.87	$47.32	$231.77
Multi Family, 4 unit apartment or condo	$86.99	$45.66	$11.83	$144.48
Mobile Home Park, 125 unit	$33.62	$30.45	$0.38	$64.45
Single Family, Bayridge Estates/Vista De Oro Tracts	$67.06	$60.87	$0.65	$128.58
Low-Load, Non-Resid, 5 tentants, 50k ft^2	$114.47	$67.48	$9.46	$191.42
Med-Load, Non-Resid, two tentant, 15k ft^2	$89.84	$81.84	$23.66	$195.33
High-Load, Non-Resid, one tenant, 20k ft^2	$235.78	$310.78	$47.32	$593.88
Special User (septage)	$0.00	$1.95	$0.00	$1.95

b. Equivalent Dwelling Unit Calculations:

Property Assessments for Special Benefits Portion of Capital Costs: The project Assessment Engineer's Report for the project assessment district developed the calculations for "special benefit" units for various components of the project. The benefit unit calculation allocates costs to each equivalent dwelling unit (EDU) based on infrastructure needed and estimated wastewater generation. The tables below summarize the calculations in the Assessment Engineer's Report. Benefit units are apportioned to several use categories and special cases, based on wastewater generation estimates, and allocated to each project component. The actual assessment charge for each property, as detailed in the Assessment Engineer's Report, will be the basis for all assessment related charges. The total property assessments for all "special benefits" are assumed to be $154,444,000.

Table 7.5 Assessment Benefit Unit Allocation

Use Category	Benefit Units (BU)				
	Lateral	Collector	Trunk	Treatment & Disposal	Common Facility
Residential Single Family	1	1	1	1	1
Residential Multi-Family	1	0.75/unit	0.75/unit	0.75/unit	0.75/unit
Mobile Homes	1	0	0.5/unit	0.5/unit	0.5/unit
Vista del Oro & Bayridge Estates tracts	0	0	1	1	1
Commercial / Non-Residential	1	1/10,000-sf	1/10,000-sf	1/10,000-sf	1/10,000-sf
Special Cases were analyzed individually, including condominiums, mobile home parks, schools, churches, and public facilities.					

Table 7.6 Assessment Benefit Unit Weighted Average (EDU's)

Component	Special Benefit Assessment Cost	BU's for Build-Out Parcels	Cost per BU	Component % of Total Cost	Weighted Average BU's - Build-Out Parcels
Lateral	$10,956,000	4769	$2,297.34	9%	439.3
Collector	$52,341,045	5745.47	$9,109.97	37%	2098.6
Trunk	$23,105,955	6734.72	$3,430.87	14%	926.4
Treatment	$49,551,000	6734.72	$7,357.54	29%	1986.7
Common	$18,490,000	6734.72	$2,745.47	11%	741.3
Totals	$154,444,000		$24,941.19	100%	6192.3

Table 7.7 Example Assessment Charges by User Group

Example User Group	Total Assessment	Total Monthly Charge	Per Unit Monthly Charge
Single Family Residence	$24,941.19	$123.58	$123.58
Multi Family, 4 unit apartment or condo	$70,228.89	$347.97	$86.99
Mobile Home Park, 125 unit	$848,164.84	$4,202.53	$33.62
Single Family, Bayridge Estates/Vista De Oro Tracts	$13,533.88	$67.06	$67.06
Non-Resid, 5 tentants, 50k ft^2	$115,516.59	$572.37	$114.47
Non-Resid, two tentant, 15k ft^2	$36,263.12	$179.68	$89.84
Non-Resid, one tenant, 20k ft^2	$47,585.04	$235.78	$235.78

User Charges for General Benefit Portion of Capital Costs and O&M Costs: The Project Revenue Analysis, submitted for the USDA Rural Development program application, contains revenue tables in the Exhibits. EDU calculations have been developed for residential and non-residential user groups based on wastewater generation and loading estimates for the purpose of allocating project user charges. The estimates are based on current development only, which will be the start-up rate base for project user charges.

Table 7.8 User Charges EDU's

User Group	Number of Accounts	EDU's/Account	Total EDU's
Single Family	4289	1.00	4289
Multi Family	809	0.75	607
Mobile Home	542	0.50	271
Low-load Non-Resid	147	1.11	163
Med-load Non-Resid	5	1.34	7
High-load Non-Resid	17	5.08	86
Special User (septage)	749	0.03	24
Totals	**6,558**		**5447**

Table 7.9 Example User Charges by User Group

User Group	# of Accts	Variable O M & R	Fixed O M & R	Capital Replace. Fund	Debt Service	Debt Service Reserve	Total Annual Revenue	Avg. Monthly Revenue
Single Family	4289	$446,099	$1,416,592	$158,306	$1,011,132	$100,665	$3,132,794	$60.87
Multi Family	809	63,115	200,421	22,397	143,056	14,242	443,232	45.66
Mobile Home	542	28,201	89,553	10,008	63,921	6,364	198,047	30.45
Low-load Non-Resid	147	16,950	53,826	6,015	38,420	3,825	119,037	67.48
Med-load Non-Resid	5	633	2,462	204	1,444	167	4,910	81.84
High-load Non-Resid	17	8,008	32,385	2,521	18,299	2,186	63,400	310.78
Special User (septage)	749	1,994	9,759	549	4,591	637	17,530	1.95
Totals	**6558**	**$565,000**	**$1,805,000**	**$200,000**	**$1,280,863**	**$128,086**	**$3,978,949**	**$50.56**

c. Operations and Maintenance (O&M) Costs: The following tables show estimated O&M costs for labor, power, and equipment maintenance. Total project O&M costs are summarized in Table 7.13.

Table 7.10 Estimated Annual O&M Costs for Gravity Collection System

Item	Units	Quantity	Unit Price ($)	Annual O&M ($)
Labor	Hrs/year	4,160(1)	40(2)	170,000
Power	Kwh/year	500,000(3)	0.12(2)	60,000
Equipment Maintenance				200,000
TOTAL O&M COST(4)				**$430,000**

Notes:
(1) Based on 2 full-time employees and 2,080 hours per year.
(2) From Basis of Cost Evaluation Technical Memorandum.
(3) Based on energy required to convey 1.4 mgd to an out-of-town treatment facility.
(4) Septic hauling costs for homes outside of the Prohibition Zone are not included.

Annual O&M costs for each of the treatment alternatives were estimated for the following categories based on BioTran© modeling of unit process requirements.

- Labor
- Power
- Maintenance/ Equipment Replacement
- Allowances—Includes chemicals, screenings and grit disposal
- Unit cost curves for tertiary treatment per MGD
-

Table 7.11 Estimated Annual O&M Costs for Treatment Process

Item	Units	Quantity	Unit Price ($)	Annual O&M ($)
Labor	Hrs/year	5,200	60(1)	310,000
Power	Kwh/year	900,000	0.12(2)	110,000
Equipment Maintenance				75,000
Allowances				50,000
Tertiary Filter O&M				100,000
TOTAL O&M COST				**$645,000**

Notes:
(1) Labor costs are based on an average $60 hourly rate, including direct and indirect costs.
(2) Power costs based on $0.12 per kWh electrical rate.

The cost basis for biosolids processing was developed in the Fine Screening Report and is based on master planning efforts for a similar sized facility in Morro Bay, CA.

Table 7.12 Estimated Annual O&M Costs for Biosolids Processing

Item	Annual O&M ($)
Thickening[(1)]	170,000
Mechanical Dewatering[(1)]	280,000
Hauling[(2) (3)]	190,000
TOTAL O&M COST	**$640,000**

Notes:
(1) Includes labor, power, chemicals, and maintenance.
(2) Based on an average solids volume from primary and secondary treatment process of 4,000 pounds per day (dry weight) with dewatering to 18% solids.
(3) Based on a hauling and tipping fee at San Joaquin Composting facility of $42 per ton for Class B biosolids and $46 per ton for Sub-Class B biosolids.

The cost basis for recycled water reuse was developed in the Fine Screening Report, Appendix A, and is based on estimated energy costs for delivering recycled water to reuse locations and labor costs for routine maintenance.

Table 7.13 Estimated Annual O&M Costs for Recycled Water Reuse

Item	Units	Quantity	Unit Price ($)	Annual O&M ($)
Leachfield Labor	Hrs/year	1,500	60[(1)]	90,000
Leachfield Power	Kwh/year	1,375,000	0.12[(2)]	165,000
Reuse Irrigation Power	Kwh/year	333,000	0.12[(2)]	40,000
TOTAL O&M COST				**$295,000**

Notes:
(1) Labor costs are based on an average $60 hourly rate, including direct and indirect costs.
(2) Power costs based on $0.12 per kWh electrical rate.
(3) Cost estimates summarized from Table A2 of Fine Screening Report (Carollo, August, 2007)

Table 7.14 Summary of Total Project Annual O&M Cost Estimate	
	Annual O&M
Collection System	
• Labor	$170,000
• Power	$60,000
• Equipment Maintenance	$200,000
Treatment Process	
• Labor	$310,000
• Power	$110,000
• Equipment Maintenance	$75,000
• Allowances	$50,000
• Tertiary Filter O&M	$100,000
Solids Handling	
• Thickening & Dewatering	$450,000
• Hauling	$190,000
Recycled Water Reuse	
• Leachfield Energy	$165,000
• Leachfield Labor	$90,000
• Reuse Irrigation Energy	$40,000
Miscellaneous Costs	
• Habitat Mitigation	$10,000
• County Overhead and Billing	$300,000
• Contingency/Operating Reserves	$50,000
Total Annual O&M Costs	**$2,370,000**

d. Debt Repayments: The County does not have any existing wastewater facilities, or existing debt, for the community of Los Osos. Total project capital costs are assumed to be financed through the USDA Rural Utility Service program and the US EPA State Revolving Fund program. Repayment of project financing will be a combination of property assessments and user charges.

Collection of both the property assessments and user charges portions of the revenue requirements will be through the County's semi-annual property tax bills. Collection of property assessments on the property tax bills is authorized by the completed Proposition 218 proceedings. User charges are also authorized to be collected on the property tax bills pursuant to CA Health and Safety Code Sections 5470-5473.11 and County Code Section 3.22.

Any delinquent project accounts for either the property assessments or user charges will be paid by the County under the *Teeter Plan*, as provided in the CA Revenue and Taxation Code Section 4701 *et seq*. Under the Teeter Plan, the County annually distributes 100% of the secured tax revenue due to the project on a cash basis. The County is then responsible for collection of delinquent charges, plus interest and penalties, through subsequent collections.

There are 4,281 existing septic systems serving individual or multiple users that must be abandoned and the users connected to the collection system laterals in the right-of-way. Individual property owners are responsible for these improvements and costs related to all work that is necessary on their private property to abandon existing septic systems. Costs are expected to vary greatly by individual property, and are estimated in the Fine Screening Report from less than $1,500 to $10,000 or more. The average cost per property, or septic system abandonment, is estimated at $3,650 and assumed to be owner financed with a home equity line of credit or other commercial loan. Financing costs would average $47.32 per month, at an assumed 9.0% interest rate for a 10 year term. Debt service for these costs are the responsibility of each property owner and their individual lender and are not included in the estimated project revenue requirements.

Table 7.15 Estimated Annual Debt Service

	Term (yrs)	**Rate**	**Capital**	**Annual Debt Service**
USDA Loan	40[1]	4.000%	$80,000,000	$4,041,879
SRF Loan	20	3.000%	$93,500,000	$6,284,669
Homeowner financed on-lot costs	10	9.000%	$15,600,000	$2,430,793
Total Capital Financing			$189,100,000	$12,894,627

1: USDA loan 40 year term assumes interest only payments during 3 year construction period, then principal and interest amortized over remaining 37 years.

e. Reserves:

(1) Debt Service Reserve: It is assumed that all assessment backed debt, which will be collected on the property tax bills and paid by the County under the Teeter Plan will not be subject to requirements for a debt service reserve. Debt for capital costs that are general benefits and collected through user charges will require a 10% debt service reserve on the annual payment obligation for 10 years. Capital costs allocated to user charges will be financed with an SRF loan and the debt service reserve amount is shown in the estimated total revenue requirements on Table 7.3.

(2) Short-Lived Asset Reserve: A schedule of replacement frequency and costs for short-lived assets in the collection system, treatment facility and recycled water distribution is presented below. The assumed annual reserve fund for all short-lived assets is $200,000.

Table 7.16 Short-Lived Asset Reserve Schedule

Facility/Components		Overall Life Span	Service Age 5	Service Age 10	Service Age 15	Type of Service Required	Equipment Cost	Service Age 5 Total	Service Age 10 Total	Service Age 15 Total
Pocket Pump Stations										
04A										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
	Grinder Pump No. 3	15			X	Unit Replacement	$2,000	$0	$0	$2,000
07A										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
08A										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
09A										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
	Grinder Pump No. 3	15			X	Unit Replacement	$2,000	$0	$0	$2,000
09B										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
09C										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
10A										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000

Table 7.16 Short-Lived Asset Reserve Schedule

Facility/Components		Overall Life Span	Service Age 5	Service Age 10	Service Age 15	Type of Service Required	Equipment Cost	Service Age 5 Total	Service Age 10 Total	Service Age 15 Total
11A										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
12A										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
13A										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
13B										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
15B										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
Palisades										
	Grinder Pump No. 1	15		X		Unit Replacement	$2,000	$0	$2,000	$0
	Grinder Pump No. 2	15			X	Unit Replacement	$2,000	$0	$0	$2,000
Spare Pumps (All Pocket Pump Stations)										
	Grinder Pump No. 1	15				Unit Replacement	$2,000	$0	$0	$0
	Grinder Pump No. 2	15				Unit Replacement	$2,000	$0	$0	$0
	Grinder Pump No. 3	15				Unit Replacement	$2,000	$0	$0	$0
	Grinder Pump No. 4	15				Unit Replacement	$2,000	$0	$0	$0

Table 7.16 Short-Lived Asset Reserve Schedule

			Service Age					Service Age	
							5	10	15
Facility/Components	Overall Life Span	5	10	15	Type of Service Required	Equipment Cost	Total	Total	Total
Grinder Pump No. 5	15				Unit Replacement	$2,000	$0	$0	$0
West Paso Pump Station									
Pump No. 1	15		X		Unit Replacement	$37,000	$0	$37,000	$0
Pump No. 2	15			X	Unit Replacement	$37,000	$0	$0	$37,000
Pump No. 3	15			X	Unit Replacement	$37,000	$0	$0	$37,000
East Paso Pump Station									
Pump No. 1	15		X		Unit Replacement	$7,100	$0	$7,100	$0
Pump No. 2	15			X	Unit Replacement	$7,100	$0	$0	$7,100
Baywood Pump Station									
Pump No. 1	15		X		Unit Replacement	$4,300	$0	$4,300	$0
Pump No. 2	15			X	Unit Replacement	$4,300	$0	$0	$4,300
Santa Ysabel Pump Station									
Pump No. 1	15		X		Unit Replacement	$7,100	$0	$7,100	$0
Pump No. 2	15			X	Unit Replacement	$7,100	$0	$0	$7,100
Lupine Pump Station									
Pump No. 1	15		X		Unit Replacement	$19,000	$0	$19,000	$0
Pump No. 2	15			X	Unit Replacement	$19,000	$0	$0	$19,000
Pump No. 3	15			X	Unit Replacement	$19,000	$0	$0	$19,000
Solano Pump Station									
Pump No. 1	15		X		Unit Replacement	$19,000	$0	$19,000	$0
Pump No. 2	15			X	Unit Replacement	$19,000	$0	$0	$19,000
Mountain Viewm Pump Station									
Pump No. 1	15		X		Unit Replacement	$4,300	$0	$4,300	$0

Table 7.16 Short-Lived Asset Reserve Schedule

Facility/Components		Overall Life Span	Service Age 5	Service Age 10	Service Age 15	Type of Service Required	Equipment Cost	Service Age 5 Total	Service Age 10 Total	Service Age 15 Total
	Pump No. 2	15			X	Unit Replacement	$4,300	$0	$0	$4,300
Sunny Oaks Pump Station										
	Pump No. 1	15		X		Unit Replacement	$4,300	$0	$4,300	$0
	Pump No. 2	15			X	Unit Replacement	$4,300	$0	$0	$4,300
Mid Town Pump Station										
	Pump No. 1	15		X		Unit Replacement	$50,000	$0	$50,000	$0
	Pump No. 2	15		X		Unit Replacement	$50,000	$0	$50,000	$0
	Pump No. 3	15			X	Unit Replacement	$50,000	$0	$0	$50,000
	Pump No. 4	15			X	Unit Replacement	$50,000	$0	$0	$50,000
	Pump No. 5	15			X	Unit Replacement	$50,000	$0	$0	$50,000
	Mag Meter	15			X	Unit Replacement	$6,000	$0	$0	$6,000
Headworks										
Influent Pump Station										
	Influent Pump No. 1	15		X		Unit Replacement	$19,000	$0	$19,000	$0
	Influent Pump No. 2	15		X		Unit Replacement	$19,000	$0	$19,000	$0
	Influent Pump No. 3	15			X	Unit Replacement	$19,000	$0	$0	$19,000
	Influent Pump No. 4	15			X	Unit Replacement	$19,000	$0	$0	$19,000
Influent Screening										
	Mechanical Bar Screen	10		X		Unit Replacement	$138,000	$0	$138,000	$0
	Screenings Washer/Compactor	10		X		Unit Replacement	$62,000	$0	$62,000	$0
Odor Control										

Table 7.16 Short-Lived Asset Reserve Schedule

Facility/Components	Overall Life Span	Service Age			Type of Service Required	Equipment Cost	Service Age		
		5	10	15			5 Total	10 Total	15 Total
Headworks Supply Fan	15			X	Motor Replacement/ Major Mechanical Refurbishment	$9,000	$0	$0	$3,600
Headworks Exhaust Fan	15			X	Unit Replacement	$9,000	$0	$0	$9,000
Septage Receiving									
Septage Receiving Tank	30								
Septage Transfer Pump	15			X	Unit Replacement	$16,000	$0	$0	$16,000
Oxidation Ditch No. 1									
Anoxic Mixer No. 1	20								
Anoxic Mixer No. 2	20								
Aerator No. 1	20		X		Minor Mechanical Refurbishment	$121,000	$0	$18,150	$0
Aerator No. 2	20			X	Minor Mechanical Refurbishment	$121,000	$0	$0	$18,150
Oxidation Ditch No. 2									
Anoxic Mixer No. 1	20								
Anoxic Mixer No. 2	20								
Aerator No. 1	20		X		Minor Mechanical Refurbishment	$121,000	$0	$18,150	$0
Aerator No. 2	20			X	Minor Mechanical Refurbishment	$121,000	$0	$0	$18,150
Secondary Clarifier No. 1									
Clarifier Mechanism	20								
Scum Pump	15		X		Unit Replacement	$8,000	$0	$8,000	$0
Secondary Clarifier No. 2									

Table 7.16 Short-Lived Asset Reserve Schedule

	Facility/Components	Overall Life Span	Service Age 5	Service Age 10	Service Age 15	Type of Service Required	Equipment Cost	Service Age 5 Total	Service Age 10 Total	Service Age 15 Total
	Clarifier Mechanism	20								
	Scum Pump	15			X	Unit Replacement	$8,000	$0	$0	$8,000
RAS/WAS Pump Station										
	RAS/WAS Pump No. 1	15		X		Motor Replacement/ Major Mechanical Refurbishment	$30,000	$0	$12,000	$0
	RAS/WAS Pump No. 2	15			X	Unit Replacement	$30,000	$0	$0	$30,000
	RAS/WAS Pump No. 3	15			X	Unit Replacement	$30,000	$0	$0	$30,000
	RAS Mag Meter	15			X	Unit Replacement	$6,000	$0	$0	$6,000
	WAS Mag Meter	15			X	Unit Replacement	$4,000	$0	$0	$4,000
Solid Handling Facilities										
	Sludge Holding Tank	30								
	Sludge Feed Pumps No. 1 (Progressive Cavity)	25		X		Motor Replacement/ Major Mechanical Refurbishment	$40,000	$0	$16,000	$0
	Sludge Feed Pumps No.2 (Progressive Cavity)	25			X	Motor Replacement/ Major Mechanical Refurbishment	$40,000	$0	$0	$16,000
	Belt Filter Press, Centrifuge or Screw Press	20						$0	$0	$0
	Polymer Feed Unit	15			X	Unit Replacement	$31,000	$0	$0	$31,000
	Solids Conveyor No. 1	20								
	Solids Conveyor No. 2	20								

Table 7.16 Short-Lived Asset Reserve Schedule

Facility/Components	Overall Life Span	Service Age			Type of Service Required	Equipment Cost	Service Age		
		5	10	15			5 Total	10 Total	15 Total
Odor Control									
Solids Building Supply Fan	15			X	Motor Replacement/ Major Mechanical Refurbishment	$9,000	$0	$0	$3,600
Solids Building Exhaust Fan	15			X	Unit Replacement	$9,000	$0	$0	$9,000
Tertiary Filtration									$0
Disk Filter Unit No. 1	5	X			Unit Replacement	$8,000	$8,000	$0	$0
Disk Filter Unit No. 2	5	X			Unit Replacement	$8,000	$8,000	$0	$0
Disinfection									
NaOCl Storage Tank	30								
NaOCl Feed Pump No. 1	10		X		Unit Replacement	$12,000	$0	$12,000	$0
NaOCl Feed Pump No. 2	10		X		Unit Replacement	$12,000	$0	$12,000	$0
UV Bank No. 1	5	X			Unit Replacement	$163,320	$163,320	$0	$0
UV Bank No. 2	5	X			Unit Replacement	$163,320	$163,320	$0	$0
UV Bank No. 3	5	X			Unit Replacement	$163,320	$163,320	$0	$0
Effluent Pump Station									
Effluent Pump No. 1	25		X		Motor Replacement/ Major Mechanical Refurbishment	$80,000	$0	$32,000	$0
Effluent Pump No. 2	25			X	Motor Replacement/ Major Mechanical Refurbishment	$80,000	$0	$0	$32,000
Effluent Pump No. 3	25			X	Motor Replacement/ Major Mechanical Refurbishment	$80,000	$0	$0	$32,000

Table 7.16 Short-Lived Asset Reserve Schedule

Facility/Components	Overall Life Span	Service Age			Type of Service Required	Equipment Cost	Service Age		
		5	10	15			5 Total	10 Total	15 Total
Plant Water Pump No. 1	25		X		Motor Replacement/Major Mechanical Refurbishment	$21,000	$0	$8,400	$0
Plant Water Pump No. 2	25			X	Motor Replacement/ Major Mechanical Refurbishment	$21,000	$0	$0	$8,400
Potable/Fire Water Storage									
Water Storage Tank	30								
Fire Pump (Engine Driven)	20								
Storm Water Pump Station									
Storm Water Pump No. 1	20								
Storm Water Pump No. 2	20			X	Unit Replacement	$15,000	$0	$0	$15,000
Totals									
Total Cost per Replacement Period							**$506,000**	**$603,000**	**$672,000**
Annual Cost per Replacement Period							$101,200	$60,300	$44,800
Total Annual Short-Lived Assets Reserve Fund Allocation					**$206,300**				

CHAPTER 8: CONCLUSIONS AND RECOMMENDATIONS

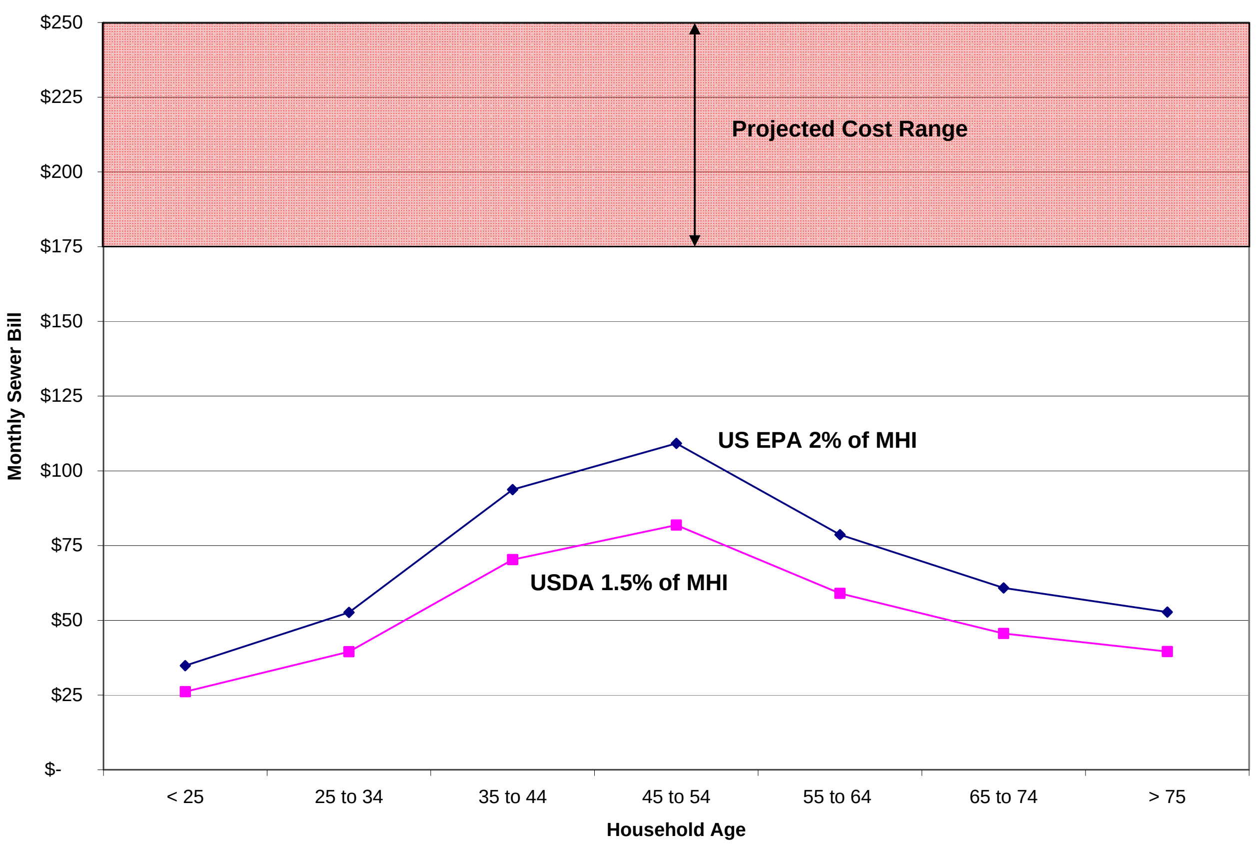
8.1. RECOMMENDATIONS FOR ADDRESSING AFFORDABILITY CHALLENGES

Project affordability has been a major challenge for the project since planning efforts began in 1983, following the Regional Water Quality Control Board's mandate to cease septic tank discharges in the Prohibition Zone. The lack of existing wastewater infrastructure requires that the community construct all of the necessary facilities for collection, treatment, and effluent reuse or disposal at one time. The large capital expenditure, plus ongoing operational costs and individual on-lot connection costs result in a total project cost that far exceeds any affordability standard in the moderate income community of Los Osos.

Financing

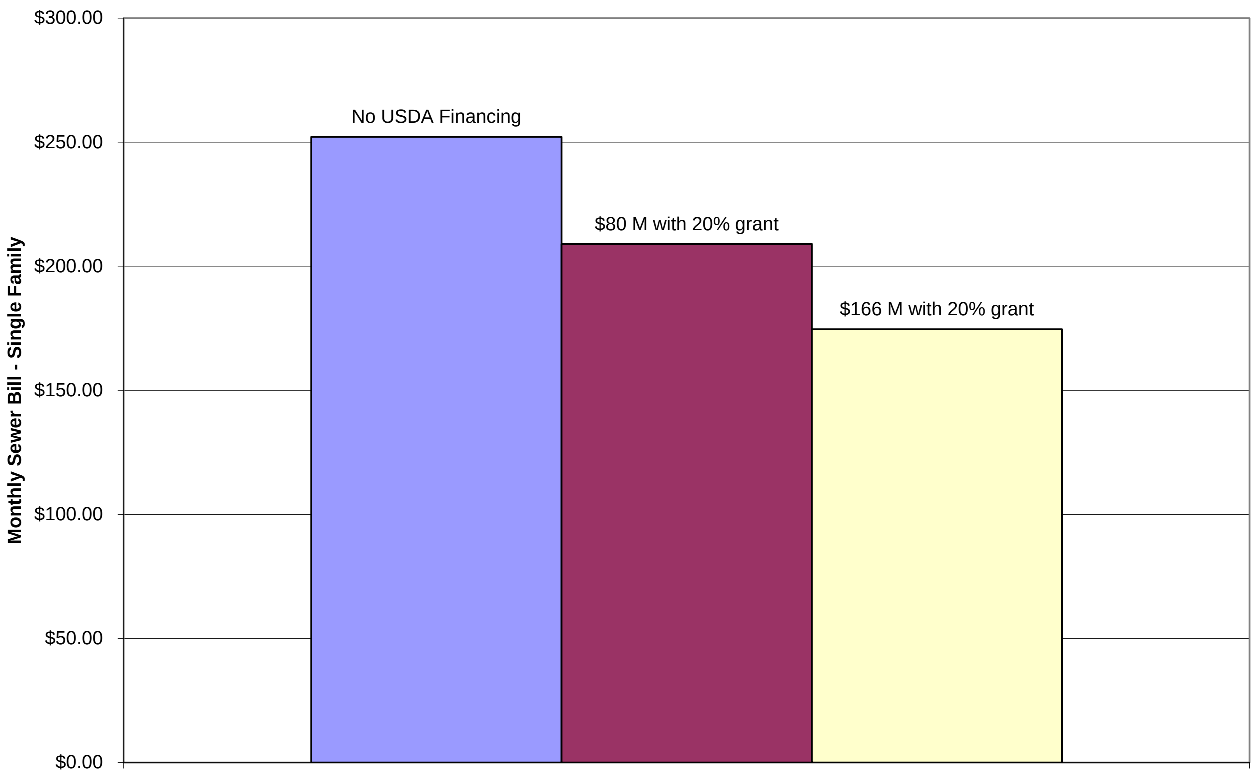
The County has evaluated project affordability as part of its overall project planning and feasibility review. Without financial assistance, the total project costs, including homeowner financed on-lot costs, are projected to exceed $250 per month for a typical, single family residence, which is more than 6% of the median household income (MHI) on an annual basis. The costs will be especially challenging for Los Osos where 33% of households receive Social Security income (50% higher than the statewide average), an indicator of fixed-income retirees.

Figure 8.1. Los Osos Affordability Thresholds by 2000 Census Household Age Category



The overall affordability impact of the project can be greatly reduced with favorable financing from the USDA Rural Development Program. USDA financing of $80 million, that includes a 20% grant component, will reduce the estimated costs for a typical single family residence by approximately $43 per month. A project that is fully funded by the USDA, including a 20% grant component, would reduce costs by an estimated $77 per month. This is more than a 30% savings over the estimated project costs without financial assistance and a substantial benefit to the community.

Figure 8.2 Benefits of Favorable USDA Financing



Mitigating project affordability impacts with USDA financing is only a first step in addressing the challenge. The County is also seeking financial assistance from several other sources, including extended term loans from the State Revolving Fund program, federal grants from the Water Resources Development Act, and state grants from the Proposition 50 and 84 Integrated Regional Water Management funds. Finally, the County is seeking to implement a financial assistance program for disadvantaged individuals in the community who are unable to afford the project costs.

Collection System Contracting

Construction contracting is the major capital cost of the project and it may be possible to realize significant savings over the current estimates. The current economic downturn has severely affected the California construction industry resulting in a highly competitive bidding climate.

Recent industry surveys, and the County's own experience, show that construction bids are being received at 30% - 40% below the engineer's estimates.

In order to capitalize on the favorable bidding climate, the County intends to pursue bids on the collection system as soon as possible after final regulatory permits are issued. The collection system represents 70% of the total construction costs and has the ability to realize the greatest savings. Early construction of the collection system is possible because the system is approximately 95% designed from the previous LOCSD project and can be made ready to advertise quickly by utilizing the existing design. The collection system also has a longer construction schedule than the treatment facility and should be started first in order to coordinate completion dates.

REFERENCES

(Note: Hyperlinks to documents on Project Website provided for all references.)

1. Carollo Engineers, in association with Crawford, Multari & Clark Associates and Cleath and Associates. 2007a. San Luis Obispo County, Los Osos Wastewater Project Development, Potential Viable Project Alternatives: Rough Screening Analysis Report. March.

2. Carollo Engineers, in association with Crawford, Multari & Clark Associates and Cleath and Associates. 2007b. San Luis Obispo County, Los Osos Wastewater Project Development, Viable Project Alternatives: Fine Screening Analysis, Final. August.

3. Carollo Engineers. 2008a. San Luis Obispo County, Los Osos Wastewater Project Development, Technical Memorandum, Effluent Reuse and Disposal Alternatives, Final. July.

4. Carollo Engineers. 2008b. San Luis Obispo County, Los Osos Wastewater Project Development, Technical Memorandum, Decentralized Treatment, Final. November.

5. Carollo Engineers. 2008c. San Luis Obispo County, Los Osos Wastewater Project Development, Technical Memorandum, Flows and Loads, Final. November.

6. Carollo Engineers. 2008d. San Luis Obispo County, Los Osos Wastewater Project Development, Technical Memorandum, Septage Receiving Station Option, Final. August.

7. Carollo Engineers. 2008e. San Luis Obispo County, Los Osos Wastewater Project Development, Technical Memorandum, Imported Water, Final. July.

8. Carollo Engineers. 2008f. San Luis Obispo County, Los Osos Wastewater Project Development, Technical Memorandum, Low Pressure Collection System, Revised Final. July.

9. Carollo Engineers. 2008g. San Luis Obispo County, Los Osos Wastewater Project Development, Technical Memorandum, Onsite Treatment, Final. May.

10. Carollo Engineers. 2008h. San Luis Obispo County, Los Osos Wastewater Project Development, Technical Memorandum, Out of Town Conveyance, Final. July.

11. Carollo Engineers. 2008i. San Luis Obispo County, Los Osos Wastewater Project Development, Technical Memorandum, Partially Mixed Facultative Pond Options, Final. July.

12. Carollo Engineers. 2008j. San Luis Obispo County, Los Osos Wastewater Project Development, Technical Memorandum, Projects Alternatives: AB 32 - Greenhouse Gas Emissions Inventory, Final Draft. June.

13. Carollo Engineers. 2008k. San Luis Obispo County, Los Osos Wastewater Project Development, Technical Memorandum, Septage Receiving Station Option, Final. August.

14. Carollo Engineers. 2008l. San Luis Obispo County, Los Osos Wastewater Project Development, Technical Memorandum, Solids Handling Options, Final. August.

15. Los Osos Wastewater Project Technical Advisory Committee. 2007. Pro/Con Analysis on Project Component Alternatives. August.

16. Michael Brandman Associates. 2008. Draft Environmental Impact Report. County of San Luis Obispo Los Osos Wastewater Project State Clearinghouse No. 2007121034. November.

17. Michael Brandman Associates. 2009. Final Environmental Impact Report/Response to Comments. County of San Luis Obispo Los Osos Wastewater Project State Clearinghouse No. 2007121034. March.

18. Montgomery Watson Harza. 2004a. Los Osos Community Services District. Volume IV – Drawings for the Construction of Los Osos Wastewater Project Area B and Area C. February.

19. Montgomery Watson Harza. 2004b. Los Osos Community Services District. Volume V – Drawings for the Construction of Los Osos Wastewater Project Area A and Area D. February.

20. Opinion Studies. 2009. Los Osos Wastewater Project Community Advisory Survey. Final Report. March.

21. San Luis Obispo County Board of Supervisors. 2009. Los Osos Wastewater Project Development Plan/Coastal Development Permit DRC2008-00103. Adopted Findings. September.

22. Wallace Group. 2007. Engineer's Report for the San Luis Obispo County Wastewater Assessment District No. 1. December.

LIST OF APPENDICES

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Appendix 1 - Bid Schedule 1 (Area B and C)

Appendix A:
Los Osos Community Service District
Collection System Bid Results: Received 2/24/2005

MWH									
Area B&C - Bid Schedule 1				Eng. Est.		Low Bid #1		Low Bid #2	
				MWH		Whitaker		Barnard	
Bid Item	Description	UOM	Quantity	Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1	Area Mobe/GCs/TCs	LS	1		$940,224		$1,200,000		$1,590,000
2	Area Sheeting, Shoring, Sloping & Bracing	LS	1		$703,034		$492,000		$4,839,000
3	48" Standard Gravity Sewer Manhole	EA	350	$4,099	$1,434,642	$3,450	$1,207,500	$6,000	$2,100,000
4	48" Drop Manhole	EA	20	$4,728	$94,553	$5,810	$116,200	$13,000	$260,000
5	48" Beaver Slide Manhole	EA	1	$5,289	$5,289	$5,163	$5,163	$5,000	$5,000
6	48" Force Main to Gravity Sewer Trans MH	EA	2	$5,886	$11,773	$7,310	$14,620	$10,000	$20,000
7	(Not Used)	EA	0		$0		$0		$0
8	8" Gravity Sewer	LF	74000	$64	$4,700,504	$132	$9,768,000	$120	$8,880,000
9	10" Gravity Sewer	LF	2000	$74	$148,711	$169	$338,000	$125	$250,000
10	12" Gravity Sewer	LF	1600	$64	$102,052	$108	$172,800	$150	$240,000
11	(Not Used)	LF	0		$0		$0		$0
12	15" Gravity Sewer	LF	3800	$69	$263,628	$108	$410,400	$130	$494,000
13	18" Gravity Sewer	LF	220	$87	$19,094	$253	$55,660	$135	$29,700
14	4" Sewer Lateral	EA	1700	$2,715	$4,615,942	$1,220	$2,074,000	$1,800	$3,060,000
15	4" Sewer Lateral from (E) Sewer MH	EA	5	$3,175	$15,875	$1,490	$7,450	$4,000	$20,000
16	6" Sewer Lateral	EA	24	$2,842	$68,214	$1,577	$37,848	$1,500	$36,000
17	(Not Used)	EA	0		$0		$0		$0
18	48" Combination Air/Vacuum Release	EA	2	$7,668	$15,335	$10,625	$21,250	$10,000	$20,000
19	(Not Used)	LF	0		$0		$0		$0
20	4" Force Main	LF	2900	$32	$92,001	$89	$258,100	$30	$87,000
21	(Not Used)	LF	0		$0		$0		$0
22	(Not Used)	LF	0		$0		$0		$0
23	10" Force Main	LF	7700	$79	$610,699	$59	$454,300	$45	$346,500
24	14" Force Main	LF	2800	$95	$266,451	$119	$333,200	$75	$210,000
25	3/4", 1/2" & 2" Polybutylene Water Svc	EA	320	$1,413	$452,067	$1,038	$332,160	$2,150	$688,000
26	(Not Used)	LF	0		$0		$0		$0
27	(Not Used)	EA	0		$0		$0		$0
28	2" Fiber Optic Cable Conduit	LF	3200	$8	$24,994	$17	$54,400	$13	$41,600
29	Fiber Optic Manhole	EA	6	$4,708	$28,247	$5,142	$30,852	$5,500	$33,000
30	Duplex Pump Station	EA	2	$137,492	$274,985	$212,925	$425,850	$400,000	$800,000
31	Triplex Pump Station	EA	1	$250,708	$250,708	$316,750	$316,750	$600,000	$600,000
32	(Not Used)	EA	0		$0		$0		$0
33	Standby Power Facility	EA	3	$228,471	$685,412	$252,350	$757,050	$350,000	$1,050,000
34	6" Harvest Main	LF	6100	$41	$252,397	$43	$262,300	$25	$152,500
35	Harvest Main Valve Vaults	EA	2	$5,885	$11,770	$15,445	$30,890	$20,000	$40,000
36	Harvest Well/Well House	EA	2	$170,008	$340,016	$289,149	$578,298	$700,000	$1,400,000
37	(Not Used)	EA	0		$0		$0		$0
38	Flow Control Vaults	EA	4	$5,080	$20,320	$40,900	$163,600	$50,000	$200,000
39	(Not Used)	EA	0		$0		$0		$0
40	Reclaimed Water Turnouts	EA	11	$2,540	$27,940	$1,803	$19,833	$4,450	$48,950
41	6" Disposal Main	LF	1800	$41	$74,478	$78	$140,400	$20	$36,000
42	8" Disposal Main	LF	5400	$55	$297,912	$60	$324,000	$24	$129,600
43	12" Disposal Main	LF	8800	$83	$728,228	$68	$598,400	$75	$660,000
44	4" Disposal Header	LF	1200	$28	$33,101	$17	$20,400	$11	$13,200
45	6" Disposal Header	LF	720	$41	$29,791	$20	$14,400	$12	$8,640
46	8" Disposal Header	LF	17000	$51	$861,873	$20	$340,000	$14	$238,000
47	Broderson 4" Percolation Piping	LF	20000	$25	$507,492	$75	$1,500,000	$60	$1,200,000
48	Monitoring Wells	EA	10	$4,675	$46,749	$4,150	$41,500	$4,800	$48,000
49	24" Bored & Jacked Casing	LF	100	$175	$17,526	$552	$55,200	$2,000	$200,000
50	Fencing	LF	3200	$19	$60,960	$18	$57,600	$25	$80,000
51	Tree Removal at Broderson	EA	40	$413	$16,510	$4,321	$172,840	$1,500	$60,000
52	Install Native Vegetation	SF	350,000	$0.13	$44,450	$1.70	$595,000	$2.25	$787,500
53	LOVR Improvements	LS	1	$254,000	$254,000	$276,500	$276,500	$500,000	$500,000
54	Cultural Resources Caused Mobe/Demobe	EA	5	$4,445	$22,225	$3,000	$15,000	$15,000	$75,000
55	Overexcavation & Repl w/ Found Rock	CY	200	$44	$8,890	$212	$42,400	$160	$32,000
56	Addl Pvmt Restoration Ordered By ENGR	SF	12000	$3.81	$45,720	$4.80	$57,600	$5.00	$60,000
57	Utility Crossing Not Shown or Identified	EA	20	$2,193	$43,866	$2,500	$50,000	$5,000	$100,000
57A	Disinfect Construction Dewatering Water	DAY	60	$3,810	$228,600	$4,455	$267,300	$3,200	$192,000
					$19,800,000		$24,507,014		$31,961,190

Appendix 2 - Bid Schedule 2 (Area A and D)

Appendix A:
Los Osos Community Service District
Collection System Bid Results: Received 2/24/2005

Los Osos Wastewater Project							
Area A&D - Bid Schedule 2				Eng. Est.		Low Bid #1	
				MWH		Barnard	
Bid Item	Description	UOM	Quantity	Unit Price	Amount	Unit Price	Amount
1	Area Mobe/GCs/TCs	LS	1		$1,272,771		$2,050,000
2	Area Sheeting, Shoring, Sloping & Bracing	LS	1		$769,608		$4,015,000
3	48" Standard Gravity Sewer Manhole	EA	340	$4,092	$1,391,110	$6,600	$2,244,000
4	48" Drop Manhole	EA	50	$4,719	$235,945	$8,500	$425,000
5	48" Beaver Slide Manhole	EA	28	$5,279	$147,820	$5,000	$140,000
6	48" Force Main to Gravity Sewer Trans MH	EA	4	$5,876	$23,502	$10,000	$40,000
7	48" Pocket PS FM Discharge MH	EA	12	$5,876	$70,506	$6,500	$78,000
8	8" Gravity Sewer	LF	93000	$67	$6,235,608	$120	$11,160,000
9	10" Gravity Sewer	LF	11000	$69	$762,644	$125	$1,375,000
10	12" Gravity Sewer	LF	3200	$80	$256,370	$150	$480,000
11	(Not Used)				$0		$0
12	15" Gravity Sewer	LF	2400	$78	$187,469	$175	$420,000
13	18" Gravity Sewer	LF	7000	$85	$595,290	$140	$980,000
14	4" Sewer Lateral	EA	3000	$2,710	$8,130,665	$1,800	$5,400,000
15	(Not Used)	EA	0		$0		$0
16	6" Sewer Lateral	EA	24	$2,837	$68,087	$1,200	$28,800
17	8" Sewer Lateral	EA	21	$2,964	$62,238	$1,300	$27,300
18	48" Combination Air/Vacuum Release	EA	31	$7,654	$237,259	$9,500	$294,500
19	2" Force Main	LF	8900	$19	$168,106	$30	$267,000
20	(Not Used)	LF	0		$0		$0
21	6" Force Main	LF	1800	$47	$85,499	$110	$198,000
22	8" Force Main	LF	2600	$63	$164,665	$40	$104,000
23	(Not Used)	LF	0		$0		$0
24	14" Force Main	LF	6000	$95	$569,952	$80	$480,000
25	3/4", 1/2" & 2" Polybutylene Water Svc	EA	480	$1,410	$676,854	$2,150	$1,032,000
26	Elec Duct Bank	LF	3100	$44	$135,258	$320	$992,000
27	Electrical or Instrumentation Pullbox	EA	7	$587	$4,109	$7,000	$49,000
28	2" Fiber Optic Cable Conduit	LF	8800	$8	$68,608	$20	$176,000
29	Fiber Optic Manhole	EA	15	$4,699	$70,491	$10,000	$150,000
30	Duplex Pump Station	EA	4	$158,979	$635,916	$400,000	$1,600,000
31	Triplex Pump Station	EA	1	$171,084	$171,084	$500,000	$500,000
32	Pocket Pump Station	EA	12	$68,685	$824,216	$180,000	$2,160,000
33	Standby Power Facility	EA	4	$226,229	$904,916	$325,000	$1,300,000
33A	Furnish Area B & Area C Equipment	LS	1	$316,891	$316,891	$350,000	$350,000
34	6" Harvest Main	LF	8500	$41	$351,026	$30	$255,000
35	Harvest Main Valve Vaults	EA	2	$5,874	$11,748	$20,000	$40,000
36	Harvest Well/Well House	EA	1	$170,008	$170,008	$500,000	$500,000
36A	East Paso Production Well	LS	1	$215,486	$215,486	$500,000	$500,000
37	(Not Used)	EA	0		$0		$0
38	Flow Control Vaults	EA	2	$5,070	$10,140	$50,000	$100,000
39	Vertical Disposal Wells	EA	48	$5,070	$243,372	$15,000	$720,000
40	Reclaimed Water Turnouts	EA	13	$2,535	$32,957	$4,600	$59,800
41	6" Disposal Main	LF	5000	$41	$206,486	$40	$200,000
42	8" Disposal Main	LF	4800	$55	$264,302	$45	$216,000
43	12" Disposal Main	LF	21700	$83	$1,792,397	$60	$1,302,000
44	4" Disposal Header	LF	200	$28	$5,506	$30	$6,000
45	(Not Used)	LF	0		$0		$0
46	(Not Used)	LF	0		$0		$0
47	(Not Used)	LF	0		$0		$0
48	Monitoring Wells	EA	10	$4,666	$46,659	$5,000	$50,000
49	30" Bored & Jacked Casing	LF	340	$254	$86,194	$1,100	$374,000
50	(Not Used)	LF	0		$0		$0
51	(Not Used)	EA	0		$0		$0
52	(Not Used)	SF	0		$0		$0
53	(Not Used)	LS	0		$0		$0
54	Cultural Resources Caused Mobe/Demobe	EA	15	$4,437	$66,551	$15,000	$225,000
55	Overexcavation & Repl w/ Found Rock	CY	300	$44	$13,310	$160	$48,000
56	Addl Pvmt Restoration Ordered By ENGR	SF	18000	$3.80	$68,454	$5	$90,000
57	Utility Crossing Not Shown or Identified	EA	20	$2,189	$43,786	$5,000	$100,000
57A	Disinfect Construction Dewatering Water	DAY	60	$3,803	$228,176	$3,200	$192,000
					$29,100,000		$43,493,400

Exhibit 2G

PFM

The PFM Group

Public Financial Management, Inc.
PFM Asset Management, LLC
PFM Advisors

San Luis Obispo County, California

Los Osos Wastewater Project

Required Project Revenue Analysis for Submission to USDA

May 13, 2010

Prepared by

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San Luis Obispo County, California
Los Osos Wastewater Project
Project Revenue Analysis

Summary Report

Project Overview
Interim and Long Term Financing
Description of Capital Financing Scenarios
Summary of Resulting Los Osos Wastewater Rates
Overall Ongoing Wastewater User Costs

Exhibit A – Summary of Wastewater Charges and Overall Costs:

Exhibit B – Overall Los Osos Wastewater Annual Costs:

Exhibit C - Loan Drawdown Assumptions

Exhibit D - Loan Repayment Scenarios:

Exhibit E - Required Project Revenue Analysis:

At the request of San Luis Obispo County, California (the "County"), Public Financial Management, Inc. has prepared the following analysis to estimate the wastewater rates required (a) to repay the capital funding anticipated to be raised to design and construct the proposed Los Osos Wastewater Project (the "Project"), and (b) to operate and maintain the Project. The analysis will also include a discussion of the possible capital funding scenarios for the Project and how these scenarios impact the ultimate required wastewater rates.

PROJECT OVERVIEW

The Project will serve an area of the Los Osos community within the County with an existing population of approximately 12,500 and a build-out population estimated at approximately 14,500. The service area is currently served by on-site septic systems, therefore the Project will consist of almost entirely new facilities for wastewater collection, treatment, and reuse to serve 4,769 planned connections. The total capital cost of the Project, including on-lot costs arranged and financed individually by users, is anticipated to be approximately $190 million.

Table 1: Los Osos Project Costs

Collection System	$107,570,000
Treatment Process	29,100,000
Solid Process	4,380,000
Effluent Reuse/Disposal	10,100,000
Water Recycling	7,850,000
Water Conservation	5,000,000
Land	2,000,000
Total Construction Related Costs	$ 166,000,000
Payment of defaulted CSD SRF Loan	6,500,000
Repayment of County Interest	200,000
Capitalized Interest for Interim Financing	455,000
Cost of Issuance for Interim Financing	455,000
SRF and USDA Financed Costs	173,610,000
On-Lot Construction Costs	15,600,000
Aggregate Community Financing Needs	$189,210,000

The category of users considered for this analysis is comprised of the following seven groups:

Table 2: Project User Groups and Accounts

Single Family Residential	4,289
Multi Family Residential	809
Mobile Homes	542
Low-Load Non Residential	147
Medium-Load Non Residential	5
High-Load Non Residential	17
Special Users (Septage)	749
	6,558

The number of accounts identifies the current developed properties and anticipated wastewater users for the Project. If a second Proposition 218 vote is passed for assessments to be levied on undeveloped properties, another approximate 650 parcel-owners will be making payments to finance the Project.

Determination of Project Rates

The rates outlined in the accompanying wastewater rate analysis are based on several assumptions incorporated into the wastewater rate model. The overall wastewater fees necessary to be generated by the Project will be sufficient to finance the operating, maintenance, and replacement costs ("OM&R"), debt service related costs ("DSR"), and required related reserves and coverage levels. This report relies on the OM&R and related coverage levels provided by the County that have been estimated and calculated by engineers and other qualified professionals. PFM makes no determination related to the sufficiency of these calculations and knows of no reason why these figures may be incorrect or should not be incorporated into the aggregate wastewater rate analysis.

Capital Funding Sources

The long-term capital sources outlined within the accompanying analysis are a $80 million funding by the United State Department of Agriculture (in the form of a loan and possibly partial grant, "USDA Loan" and "USDA Grant") and a $93,610,000 California State Revolving Fund loan ("SRF Loan"). The accompanying wastewater rate calculations reflect some scenarios that have up to 20% of the USDA funding being awarded in the form of a USDA Grant. Predevelopment costs of $7.45 million have been fronted to date by the County ("County Loan"), and an interim financing is assumed to be necessary to repay the County Loan and to finance additional Project costs prior to when the long-term financing becomes available.

INTERIM AND LONG TERM FINANCING

An initial financing is anticipated to be necessary prior to the availability the USDA Loan, USDA Grant, and the SRF Loan. This interim financing will be used (a) to repay the County for the funds that it has provided to date for the Project's predevelopment, (b) to fund the acquisition of land for the treatment facility, and (c) to finance additional predevelopment and other Project costs. The financing is conservatively structured to fund cost of issuance and interest payments (each equal to approximately 2% of the financing). Because the County is trying to limit the DSR, costs of the Project not permitted to be repaid by Assessments will be requested by the County to be funded by the USDA Grant. A summary of the Interim Financing's sources and uses is shown as follows.

Table 3: Sources & Uses of Interim Financing

Sources:	Loan Anticipation Note	$22,610,000
Uses:	Repay County Loan	$7,450,000
	Interest on County Loan (assumed)	200,000
	Remaining Predevelopment Costs	12,050,000
	Land Acquisition	2,000,000
	Capitalized Interest	455,000
	Cost of Issuance	455,000
		$22,610,000

The Project's long-term financing is currently assumed to be provided by a USDA Loan, a potential USDA Grant, and an SRF Loan. The County will propose that the USDA Loan and USDA Grant be used to (a) takeout the Interim Financing, (b) finance remaining predevelopment costs, and (c) fund specific contracts relating to the Collection System. The County will propose that the SRF Loan be used to finance all remaining construction and related capital costs of the Project. A Summary of the long-term sources and uses is shown in the following table. This table depicts 20% of the USDA award in the form of a grant. If a grant is not awarded, the $16 million USDA Grant would be deleted and the USDA Loan would change from $64 million to $80 million.

Table 4: Sources & Uses of Long-Term Financing

Sources:	USDA Loan	$ 64,000,000
	USDA Grant	16,000,000
	SRF Loan	93,610,000
		$173,610,000
Uses:	Interim Financing Payoff	$ 22,610,000
	Collection System	97,761,548
	Treatment Process	26,447,453
	Solid Process	3,980,612
	Effluent Reuse/Disposal	9,175,647
	CSD defaulted SRF Loan	6,500,000
	Water Recycling	7,134,740
		$173,610,000

The USDA Loan is structured within these analyses to be repaid solely from Assessments. A significant portion of the SRF Loan will also be repaid by Assessments and the remaining portion of the SRF Loan will be repaid by Project revenues. If the Proposition 218 vote for the undeveloped property is passed a smaller portion of the SRF Loan will need to be repaid by Project revenues. If the USDA awards 20% of its estimated funding in the form of a grant, the amount of SRF Loan required to be repaid by Project revenues will also be reduced.

Assumed Drawdown of Funds

Exhibit C shows the assumed drawdown timing and amounts of the SRF Loan, USDA Loan, and USDA Grant under the different funding scenarios. The drawdown schedule of the USDA Loan assumes an immediate retirement of the Interim Financing, and then 36 level monthly draws for the remaining balance. The drawdown schedule of the SRF Loan assumes an immediate repayment of the Los Osos Community Service District's ("CSD") defaulted $6.5 million SRF Loan, and then 24 level monthly draws for the remaining balance. The SRF Loan is assumed to begin its draw schedule 1 year after the USDA Loan so that both loans' proceeds are exhausted at the same time (after an overall 36 month project construction schedule). In the financing scenarios that use a USDA Grant, the grant is combined with the USDA Loan to determine monthly draws, but the grant funds are scheduled to be drawn after the loan proceeds.

Sources of Repayment

The USDA Loan and SRF Loan are anticipated to be repaid by Project revenues and assessments collected on properties located in the Los Osos community. In October of 2007, owners of developed properties passed a Proposition 218 vote that resulted in a principal assessment amount of approximately $127 million (the "Assessment"). Additionally, it is the intention of the County to generate an assessment amount on undeveloped properties in the principal amount of approximately $28 million through a second Proposition 218 vote. If passed, the aggregate principal assessment amount will exceed $154 million as follows:

Los Osos Project Assessments

Developed Property Assessment (passed in October 2007)	$126,722,296
Undeveloped Property Assessment (to be voted on)	27,721,704
	$154,444,000

DESCRIPTION OF CAPITAL FINANCING SCENARIOS

PFM has calculated DSR under four different financial scenarios. The main differences between these scenarios will be whether (a) the County's proposed $28 million Proposition 218 vote on undeveloped properties within the Los Osos community will pass or not, and (b) if the requested $80 million USDA funding will have a 20% grant component or not. If the second Proposition 218 vote passes, a significantly greater portion of Project's financing will be able to be repaid by Assessments. If $16 million of grant funds is received by the County, the estimated DSR for the Project will be reduced. The following chart depicts the four analyzed scenarios.

Table 5: Four DSR Analyzed Scenarios

	USDA GRANT	
2ND ASSESSMENT	Scenario 1 No / No	Scenario 2 No / Yes
	Scenario 3 Yes / No	Scenario 4 Yes / Yes

Impact of the USDA Grant and Second Proposition 218 Vote

Assuming that 20% of the $80 million USDA provided financing is awarded as a grant, the amount of collected Assessments necessary to repay the USDA Loan will be reduced by 25%. If a grant is awarded, and the 218 Proposition vote related to the undeveloped properties passes, a minimal amount of Project Revenues will be required to repay the Project's capital cost. However, since the repayment of CSD's defaulted SRF Loan may not be repaid by Assessments, a minimum amount of $6,500,000 of the capital expenditures is anticipated to be repaid by Project Revenues under any scenario.

Below is a matrix of the Project's funding sources that would be repaid by Assessments and future Project revenues under each of the four scenarios. The highlighted category represents the portion of the SRF Loan that would be repaid with future Project revenues. The non-highlighted sources of funding for the Project are estimated to be repaid by Assessments.

Table 6: Sources of Funding – Four Scenarios

2nd Assessment	$16MM USDA Grant: No		$16MM USDA Grant: Yes	
	Scenario 1		**Scenario 2**	
No	USDA Loan	$80,000,000	USDA Loan	$64,000,000
	USDA Grant	-	USDA Grant	16,000,000
	SRF Loan	46,722,296	SRF Loan	62,722,296
	SRF Loan - DSR	46,887,704	SRF Loan - DSR	30,887,704
		$173,610,000		$173,610,000
	Scenario 3		**Scenario 4**	
Yes	USDA Loan	$80,000,000	USDA Loan	$64,000,000
	USDA Grant	-	USDA Grant	16,000,000
	SRF Loan	74,444,000	SRF Loan	87,110,000
	SRF Loan - DSR	19,166,000	SRF Loan - DSR	6,500,000
		$173,610,000		$173,610,000

The USDA Loan is assumed to have a term of 40 years and to be repaid by Assessments only; however, the USDA Loan's annual repayment amount will depend on whether or not a grant is awarded. The USDA Loan is assumed to be structured to pay interest only on the amount drawn through a 3-year construction period, and then have 37 years of level annual principal and interest payments until maturity in year 40. The interest rate is estimated to be 4.0%.

The SRF Loan is assumed to have a term of 20 years and its annual repayment amount will remain the same under all scenarios; however, the annual repayment composition between Assessments and Project

Revenues will differ under each scenario based upon the award of the grant and the second Proposition 218 vote. The SRF Loan is assumed to accrue simple interest for a 2-year construction period that starts a year later than the USDA Loan, and then 20 annual level debt payments beginning in year 4 through year 23. The interest rate is estimated to be 3.0%.

The repayment schedules of the USDA Loan and SRF Loan under each of the four scenarios are provided in Exhibit B. It is important to remember that the financing terms of the USDA Loan and SRF Loan are different. Because the SRF Loan is assumed to be repaid over 20 years, annual debt service will be greater on the SRF Loan than on equivalent amounts of principal for the USDA Loan that has a repayment period of 40 years. The following chart reflects a summary matrix of the assumed full annual debt service payments under each of the four scenarios broken down by funding source (SRF Loan and USDA Loan) and by repayment source (Assessments and Project revenues).

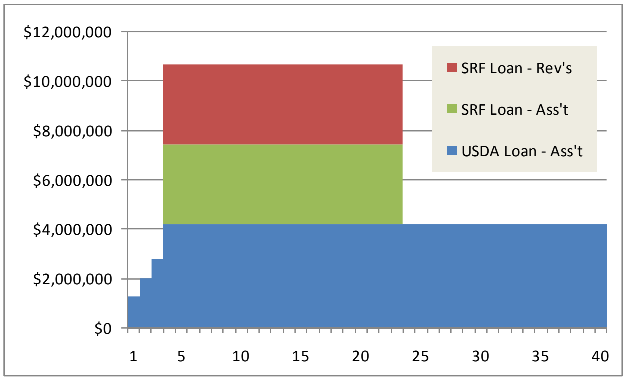
Table 7: Assumed Annual Required Debt Payments

		No USDA Grant $80 MM USDA Loan			$16MM USDA Grant $64 MM USDA Loan	
		Scenario 1			***Scenario 2***	
		SRF Loan			*SRF Loan*	
No Vote	**Rev's**	**3,249,037**	**20 yrs**	**Rev's**	**2,140,333**	**20 yrs**
$127 MM Assessment	**Ass't**	**3,237,575**	**"**	**Ass't**	**4,346,279**	**"**
		6,486,612			**6,486,612**	
		USDA Loan			*USDA Loan*	
	Ass't	**4,179,165**	**40 yrs**	**Ass't**	**3,343,332**	**40 yrs**
		Scenario 3			***Scenario 4***	
		SRF Loan			*SRF Loan*	
Yes Vote	**Rev's**	**1,328,089**	**20 yrs**	**Rev's**	**450,411**	**20 yrs**
$154 MM Assessment	**Ass't**	**5,158,523**	**"**	**Ass't**	**6,036,201**	**"**
		6,486,612			**6,486,612**	
		USDA Loan			*USDA Loan*	
	Ass't	**4,179,165**	**40 yrs**	**Ass't**	**3,343,332**	**40 yrs**

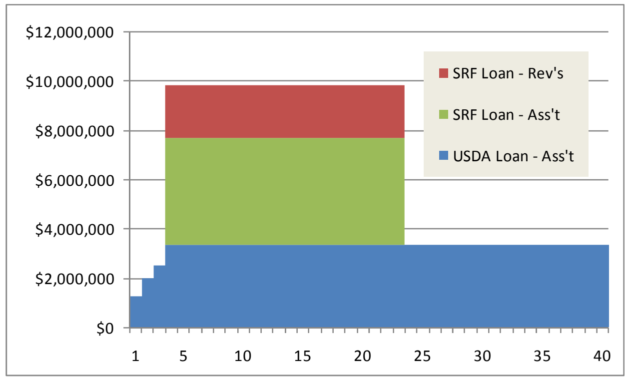
It is important to note that the above table reflects only the annual debt service payments and not the required annual payments for reserves related to such debt. ***It is assumed in the accompanying analysis that the portion of the SRF Loan repaid by Project revenues will require a debt reserve fund equal to one annual debt service payment and that this requirement will be satisfied by setting aside 10% of the annual payment for each of the first ten years that the Project is generating revenue.*** Reserve payments are not anticipated to be made for the USDA Loan or portion of the SRF Loan supported by Assessments due to the County's practice of funding delinquent assessments under the "Teeter Plan".

The following graphs illustrate the estimated annual payments required to repay the Project's long term capital financing. The red and green areas represent the respective annual debt service portion of the 20-year SRF Loan to be repaid by Project revenues and Assessments. The blue areas reflect the estimated annual debt service portion of the USDA Loan to be repaid by Assessments.

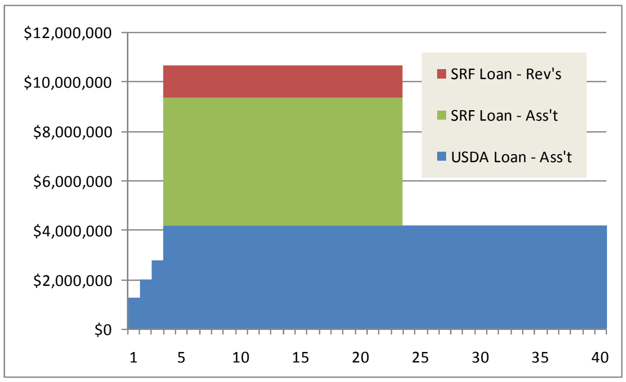
Scenario 1: No USDA Grant / No 2nd Assessment Vote



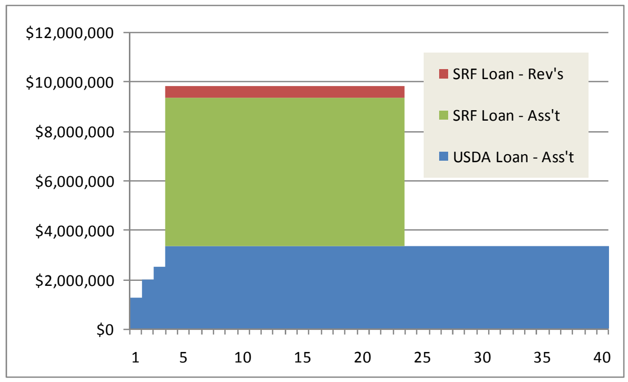
Scenario 2: USDA Grant / No 2nd Assessment Vote



Scenario 3: No USDA Grant / 2nd Assessment Vote



Scenario 4: USDA Grant / 2nd Assessment Vote



SUMMARY OF RESULTING LOS OSOS WASTEWATER RATES

The Los Osos Project wastewater rates necessary to pay OM&R are assumed to remain constant in our four capital financing scenarios. The chart below summarizes these annual charges in each respective category of the OM&R's fixed portion, variable portion and capital replacement funds.

Table 8: Annual Project OMR Costs

	Fixed Portion	Variable Portion	Cap Rep Fund	Total OMR
Single Family Residential	$1,416,592	$446,099	$158,306	$2,020,997
Multi Family Residential	200,421	63,115	22,397	285,933
Mobile Homes	89,553	28,201	10,008	127,762
Low-Load Non Residential	53,826	16,950	6,015	76,792
Medium-Load Non Residential	2,462	633	204	3,299
High-Load Non Residential	32,385	8,008	2,521	42,915
Special Users (Septage)	9,759	1,994	549	12,302
	$1,805,000	$565,000	$200,000	$2,570,000

Wastewater Charges

There will be different wastewater rate charges necessary pursuant to each of the different capital financing scenarios. As previously explained, if the Proposition 218 Vote is passed to assess the undeveloped parcels, there will be more Assessments to repay the capital costs and less Project revenues will be required. Also, if the Project is awarded a USDA Grant, less Project revenues will be required to pay back the capital sources. The following chart reflects the impact of the different scenarios on the wastewater rate charges.

Table 9: Wastewater Revenues under Different Scenarios

	Scenario 1 218 Failed No Grant	Scenario 2 218 Failed Grant	Scenario 3 218 Passed No Grant	Scenario 4 218 Passed Grant
Single Family Residential	$4,841,181	$3,878,819	3,173,787	$2,411,957
Multi Family Residential	684,937	548,781	449,032	341,247
Mobile Homes	306,046	245,208	200,638	152,477
Low-Load Non Residential	183,950	147,383	120,594	91,647
Medium-Load Non Residential	7,386	5,991	4,970	3,865
High-Load Non Residential	94,877	77,146	64,155	50,118
Special Users (Septage)	25,562	21,037	17,722	14,140
	$6,143,941	$4,924,366	$4,030,898	$3,065,452
Total Accounts	6,558	6,558	6,558	6,558
Annual Charge per Account	*936.86*	*750.89*	*614.65*	*467.44*
Monthly Charge per Account	*78.07*	*62.57*	*51.22*	*38.95*

As shown in Table 9, the average monthly charge in Scenario 4 (with the second 218 vote and the USDA Grant) is approximately half of the monthly charge in Scenario 1 that has neither of these benefits. Exhibit D contains a summary of each of the four scenarios as well as the supporting information in detail. Exhibit A contains a higher level summary comparing the four scenarios.

OVERALL WASTEWATER ONGOING COSTS

The overall financial burden of the Los Osos Project to its users in the community is a combination of the costs of the on-lot construction, wastewater fees and charges, and assessments levied. The chart below shows how this aggregate associated annual wastewater cost differs among the four scenarios. While the on-lot construction cost will remain the same under each of the capital financing scenarios, the Project revenues and Assessments will change.

Table 10: Wastewater Associated Costs under Different Scenarios

	Scenario 1 218 Failed No Grant	Scenario 2 218 Failed Grant	Scenario 3 218 Passed No Grant	Scenario 4 218 Passed Grant
On-Lot Construction	$2,430,793	$2,430,793	$2,430,793	$2,430,793
Project Revenues	6,143,941	4,924,366	4,030,898	3,065,452
Assessments	7,416,741	7,689,612	9,337,689	9,379,533
	$15,991,475	$15,044,771	$15,799,380	$14,875,779
Total Accounts	6,558	6,558	7,309	7,309
Annual Charge per Account	*2,438.47*	*2,294.11*	*2,262.87*	*2,121.38*
Monthly Charge per Account	*203.21*	*191.18*	*188.57*	*176.78*

Scenarios 3 and 4 of Table 10 reflect the larger number of accounts due to the second Proposition 218 vote passing for the undeveloped properties. While this potential increase in accounts would reflect a source of revenue through the assessments levied on their applicable parcels, it is assumed that they would not yet be paying wastewater charges or incur on-lot construction costs of changing from a septic system to a connection. Exhibit A provides a more detailed breakdown of this summary among the different user categories. The allocation among the user groups is for example purposes only and does not represent the true average cost per user category because of the uncertainty of the specific on-lot construction costs and the classification of all properties towards the specific category for the determined assessments. However, reasonable assumptions were applied to this category breakdown.

Exhibit A – Summary of Wastewater Charges and Overall Costs:

COUNTY OF SAN LUIS OBISPO
LOS OSOS WASTEWATER PROJECT

SUMMARY OF REQUIRED WASTEWATER REVENUES

	Single Family Residential 4,289	Multi Family Residential 809	Mobile Homes 542	Low-Load Non Residential 147	Med-Load Non Residential 5	High-Load Non Residential 17	Special Users (Septage) 749	Aggregate Revenues 6,558
Funding Scenario 1 - No 2nd Assessment / No USDA Grant								
Total Project Revenues	4,841,181	684,937	306,046	183,950	7,386	94,877	25,562	6,143,941
Annual Average per Account	*1,128.74*	*846.65*	*564.66*	*1,251.36*	*1,477.26*	*5,581.01*	*34.13*	*936.86*
Monthly Average per Account	*94.06*	*70.55*	*47.06*	*104.28*	*123.10*	*465.08*	*2.84*	*78.07*
Funding Scenario 2 - No 2nd Assessment / USDA Grant								
Total Project Revenues	3,878,819	548,781	245,208	147,383	5,991	77,146	21,037	4,924,366
Annual Average per Account	*904.36*	*678.34*	*452.41*	*1,002.61*	*1,198.29*	*4,537.97*	*28.09*	*750.89*
Monthly Average per Account	*75.36*	*56.53*	*37.70*	*83.55*	*99.86*	*378.16*	*2.34*	*62.57*
Funding Scenario 3 - 2nd Assessment / No USDA Grant								
Total Project Revenues	3,173,787	449,032	200,638	120,594	4,970	64,155	17,722	4,030,898
Annual Average per Account	*739.98*	*555.05*	*370.18*	*820.37*	*993.91*	*3,773.83*	*23.66*	*614.65*
Monthly Average per Account	*61.67*	*46.25*	*30.85*	*68.36*	*82.83*	*314.49*	*1.97*	*51.22*
Funding Scenario 4 - 2nd Assessment / USDA Grant								
Total Project Revenues	2,411,957	341,247	152,477	91,647	3,865	50,118	14,140	3,065,452
Annual Average per Account	*562.36*	*421.81*	*281.32*	*623.45*	*773.08*	*2,948.14*	*18.88*	*467.44*
Monthly Average per Account	*46.86*	*35.15*	*23.44*	*51.95*	*64.42*	*245.68*	*1.57*	*38.95*

COUNTY OF SAN LUIS OBISPO
LOS OSOS WASTEWATER PROJECT

ANNUAL WASTEWATER RELATED COSTS

	Single Family Residential 4,289	Multi Family Residential 809	Mobile Homes 542	Low-Load Non Residential 147	Med-Load Non Residential 5	High-Load Non Residential 17	Special Users (Septage) 749	Aggregate 6,558
Funding Scenario 1 - No 2nd Assessment / No USDA Grant								
On-Lot Construction	2,264,718	44,950	5,556	81,677	5,556	28,337	-	2,430,793
Project Revenues	4,841,181	684,937	306,046	183,950	7,386	94,877	25,562	6,143,941
Assessments	5,901,264	814,996	202,659	214,583	14,597	268,641	-	7,416,741
Total Annual Wastewater Costs	13,007,163	1,544,883	514,261	480,209	27,540	391,855	25,562	15,991,475
Annual Average per Account	*3,032.68*	*1,909.62*	*948.82*	*3,266.73*	*5,507.99*	*23,050.31*	*34.13*	*2,438.47*
Monthly Average per Account	*252.72*	*159.14*	*79.07*	*272.23*	*459.00*	*1,920.86*	*2.84*	*203.21*
Funding Scenario 2 - No 2nd Assessment / USDA Grant								
On-Lot Construction	2,264,718	44,950	5,556	81,677	5,556	28,337	-	2,430,793
Project Revenues	3,878,819	548,781	245,208	147,383	5,991	77,146	21,037	4,924,366
Assessments	6,118,379	844,981	210,115	222,477	15,135	278,525	-	7,689,612
Total Annual Wastewater Costs	12,261,916	1,438,712	460,880	451,537	26,682	384,007	21,037	15,044,771
Annual Average per Account	*2,858.92*	*1,778.38*	*850.33*	*3,071.68*	*5,336.44*	*22,588.66*	*28.09*	*2,294.11*
Monthly Average per Account	*238.24*	*148.20*	*70.86*	*255.97*	*444.70*	*1,882.39*	*2.34*	*191.18*
2nd Assessment passed - adjusted accounts	4,901	924	542	168	6	19	749	7,309
Funding Scenario 3 - 2nd Assessment / No USDA Grant								
On-Lot Construction	2,264,718	44,950	5,556	81,677	5,556	28,337	-	2,430,793
Project Revenues	3,173,787	449,032	200,638	120,594	4,970	64,155	17,722	4,030,898
Assessments	7,772,173	841,907	209,350	221,668	15,079	277,512	-	9,337,689
Total Annual Wastewater Costs	13,210,677	1,335,888	415,545	423,939	25,605	370,003	17,722	15,799,380
Annual Average per Account	*2,853.85*	*1,521.76*	*766.69*	*2,695.44*	*4,618.40*	*20,046.57*	*23.66*	*2,262.87*
Monthly Average per Account	*237.82*	*126.81*	*63.89*	*224.62*	*384.87*	*1,670.55*	*1.97*	*188.57*
Funding Scenario 4 - 2nd Assessment / USDA Grant								
On-Lot Construction	2,264,718	44,950	5,556	81,677	5,556	28,337	-	2,430,793
Project Revenues	2,411,957	341,247	152,477	91,647	3,865	50,118	14,140	3,065,452
Assessments	7,807,002	845,679	210,289	222,661	15,147	278,755	-	9,379,533
Total Annual Wastewater Costs	12,483,677	1,231,876	368,322	395,985	24,569	357,210	14,140	14,875,779
Annual Average per Account	*2,683.33*	*1,392.61*	*679.56*	*2,504.44*	*4,408.83*	*19,286.33*	*18.88*	*2,121.38*
Monthly Average per Account	*223.61*	*116.05*	*56.63*	*208.70*	*367.40*	*1,607.19*	*1.57*	*176.78*

Exhibit B – Overall Los Osos Wastewater Annual Costs:

Scenario 1 – No 2nd Assessment / No USDA Grant	I
Scenario 2 – No 2nd Assessment / USDA Grant	II
Scenario 3 – 2nd Assessment / No USDA Grant	III
Scenario 4 – 2nd Assessment / USDA Grant	IV

COUNTY OF SAN LUIS OBISPO
LOS OSOS WASTEWATER PROJECT

ANNUAL WASTEWATER REVENUES AND CHARGES

Funding Scenario 1 - No 2nd Assessment / No USDA Grant

	Single Family Residential 4,289	Multi Family Residential 809	Mobile Homes 542	Low-Load Non Residential 147	Med-Load Non Residential 5	High-Load Non Residential 17	Special Users (Septage) 749	Aggregate Accounts 6,558
PERSONAL FINANCING								
On-Site Connections	4,076	40	5	147	5	17	-	
Connection Cost Factor	1.0	2.0	2.0	1.0	2.0	3.0	-	
Connection Equivalents	4,076	81	10	147	10	51	-	
Connection Cost per Goup	14,534,184	288,473	35,658	524,172	35,658	181,856	-	15,600,000
** Annual On-Site Connections Pmts	2,264,718	44,950	5,556	81,677	5,556	28,337	-	2,430,793
Annual Average per Account	*528.03*	*55.56*	*10.25*	*555.62*	*1,111.25*	*1,666.87*	*-*	*370.66*
Monthly Average per Account	*44.00*	*4.63*	*0.85*	*46.30*	*92.60*	*138.91*	*-*	*30.89*
PROJECT REVENUES								
Variable OM&R Costs	446,099	63,115	28,201	16,950	633	8,008	1,994	565,000
Fixed OM&R Costs	1,416,592	200,421	89,553	53,826	2,462	32,385	9,759	1,805,000
Capital Replacement Fund	158,306	22,397	10,008	6,015	204	2,521	549	200,000
Operational/Replacement Costs	2,020,997	285,933	127,762	76,792	3,299	42,915	12,302	2,570,000
SRF Loan Repayment	2,564,837	362,877	162,142	97,456	3,663	46,417	11,645	3,249,037
SRF Debt Reserve Fund	255,347	36,127	16,142	9,702	425	5,545	1,615	324,904
Operations and Debt Service	4,841,181	684,937	306,046	183,950	7,386	94,877	25,562	6,143,941
Annual Average per Account	*1,128.74*	*846.65*	*564.66*	*1,251.36*	*1,477.26*	*5,581.01*	*34.13*	*936.86*
Monthly Average per Account	*94.06*	*70.55*	*47.06*	*104.28*	*123.10*	*465.08*	*2.84*	*78.07*
ASSESSMENTS								
Estimated Assessments Noticed	100,828,892	13,925,011	3,462,626	3,666,355	249,412	4,590,000	-	126,722,296
USDA Loan Repayment	3,325,229	459,232	114,194	120,912	8,225	151,373	-	4,179,165
SRF Loan Repayment	2,576,035	355,764	88,465	93,670	6,372	117,268	-	3,237,575
Total Annual Assessments	5,901,264	814,996	202,659	214,583	14,597	268,641	-	7,416,741
Annual Average per Account	*1,375.91*	*1,007.41*	*373.91*	*1,459.75*	*2,919.49*	*15,802.43*	*-*	*1,130.95*
Monthly Average per Account	*114.66*	*83.95*	*31.16*	*121.65*	*243.29*	*1,316.87*	*-*	*94.25*
AGGREGATE COSTS	13,007,163	1,544,883	514,261	480,209	27,540	391,855	25,562	15,991,475
Annual Average per Account	*3,032.68*	*1,909.62*	*948.82*	*3,266.73*	*5,507.99*	*23,050.31*	*34.13*	*2,438.47*
Monthly Average per Account	*252.72*	*159.14*	*79.07*	*272.23*	*459.00*	*1,920.86*	*2.84*	*203.21*

** independent financing for on-site connections is assumed to be available at 9.0% with 10-year level annual amortizing payments

COUNTY OF SAN LUIS OBISPO
LOS OSOS WASTEWATER PROJECT

ANNUAL WASTEWATER REVENUES AND CHARGES

Funding Scenario 2 - No 2nd Assessment / USDA Grant

	Single Family Residential 4,289	Multi Family Residential 809	Mobile Homes 542	Low-Load Non Residential 147	Med-Load Non Residential 5	High-Load Non Residential 17	Special Users (Septage) 749	Aggregate 6,558
PERSONAL FINANCING								
On-Site Connections	4,076	40	5	147	5	17	-	
Connection Cost Factor	1.0	2.0	2.0	1.0	2.0	3.0	-	
Connection Equivalents	4,076	81	10	147	10	51	-	
Connection Cost per Goup	14,534,184	288,473	35,658	524,172	35,658	181,856	-	15,600,000
** Annual On-Site Connections Pmts	2,264,718	44,950	5,556	81,677	5,556	28,337	-	2,430,793
Annual Average per Account	*528.03*	*55.56*	*10.25*	*555.62*	*1,111.25*	*1,666.87*	*-*	*370.66*
Monthly Average per Account	*44.00*	*4.63*	*0.85*	*46.30*	*92.60*	*138.91*	*-*	*30.89*
PROJECT REVENUES								
Variable OM&R Costs	446,099	63,115	28,201	16,950	633	8,008	1,994	565,000
Fixed OM&R Costs	1,416,592	200,421	89,553	53,826	2,462	32,385	9,759	1,805,000
Capital Replacement Fund	158,306	22,397	10,008	6,015	204	2,521	549	200,000
Operational/Replacement Costs	2,020,997	285,933	127,762	76,792	3,299	42,915	12,302	2,570,000
SRF Loan Repayment	1,689,610	239,048	106,813	64,200	2,413	30,578	7,671	2,140,333
SRF Debt Reserve Fund	168,212	23,799	10,634	6,392	280	3,653	1,064	214,033
Operations and Debt Service	3,878,819	548,781	245,208	147,383	5,991	77,146	21,037	4,924,366
Annual Average per Account	*904.36*	*678.34*	*452.41*	*1,002.61*	*1,198.29*	*4,537.97*	*28.09*	*750.89*
Monthly Average per Account	*75.36*	*56.53*	*37.70*	*83.55*	*99.86*	*378.16*	*2.34*	*62.57*
ASSESSMENTS								
Estimated Assessments Noticed	100,828,892	13,925,011	3,462,626	3,666,355	249,412	4,590,000	-	126,722,296
USDA Loan Repayment	2,660,183	367,386	91,355	96,730	6,580	121,099	-	3,343,332
SRF Loan Repayment	3,458,196	477,595	118,760	125,747	8,554	157,426	-	4,346,279
Total Annual Assessments	6,118,379	844,981	210,115	222,477	15,135	278,525	-	7,689,612
Annual Average per Account	*1,426.53*	*1,044.48*	*387.67*	*1,513.45*	*3,026.90*	*16,383.82*	*-*	*1,172.55*
Monthly Average per Account	*118.88*	*87.04*	*32.31*	*126.12*	*252.24*	*1,365.32*	*-*	*97.71*
AGGREGATE COSTS	12,261,916	1,438,712	460,880	451,537	26,682	384,007	21,037	15,044,771
Annual Average per Account	*2,858.92*	*1,778.38*	*850.33*	*3,071.68*	*5,336.44*	*22,588.66*	*28.09*	*2,294.11*
Monthly Average per Account	*238.24*	*148.20*	*70.86*	*255.97*	*444.70*	*1,882.39*	*2.34*	*191.18*

** independent financing for on-site connections is assumed to be available at 9.0% with 10-year level annual amortizing payments

COUNTY OF SAN LUIS OBISPO
LOS OSOS WASTEWATER PROJECT

ANNUAL WASTEWATER REVENUES AND CHARGES

Funding Scenario 3 - 2nd Assessment / No USDA Grant

	Single Family Residential 4,289	Multi Family Residential 809	Mobile Homes 542	Low-Load Non Residential 147	Med-Load Non Residential 5	High-Load Non Residential 17	Special Users (Septage) 749	Aggregate 6,558
P E R S O N A L F I N A N C I N G								
On-Site Connections	4,076	40	5	147	5	17	-	
Connection Cost Factor	1.0	2.0	2.0	1.0	2.0	3.0	-	
Connection Equivalents	4,076	81	10	147	10	51	-	
Connection Cost per Goup	14,534,184	288,473	35,658	524,172	35,658	181,856	-	15,600,000
** Annual On-Site Connections Pmts	2,264,718	44,950	5,556	81,677	5,556	28,337	-	2,430,793
Annual Average per Account	*528.03*	*55.56*	*10.25*	*555.62*	*1,111.25*	*1,666.87*	*-*	*370.66*
Monthly Average per Account	*44.00*	*4.63*	*0.85*	*46.30*	*92.60*	*138.91*	*-*	*30.89*
P R O J E C T R E V E N U E S								
Variable OM&R Costs	446,099	63,115	28,201	16,950	633	8,008	1,994	565,000
Fixed OM&R Costs	1,416,592	200,421	89,553	53,826	2,462	32,385	9,759	1,805,000
Capital Replacement Fund	158,306	22,397	10,008	6,015	204	2,521	549	200,000
Operational/Replacement Costs	2,020,997	285,933	127,762	76,792	3,299	42,915	12,302	2,570,000
SRF Loan Repayment	1,048,413	148,331	66,278	39,837	1,497	18,974	4,760	1,328,089
SRF Debt Reserve Fund	104,377	14,767	6,598	3,966	174	2,267	660	132,809
Operations and Debt Service	3,173,787	449,032	200,638	120,594	4,970	64,155	17,722	4,030,898
Annual Average per Account	*739.98*	*555.05*	*370.18*	*820.37*	*993.91*	*3,773.83*	*23.66*	*614.65*
Monthly Average per Account	*61.67*	*46.25*	*30.85*	*68.36*	*82.83*	*314.49*	*1.97*	*51.22*
A S S E S S M E N T S Accounts	4,901	924	542	168	6	19	749	7,309
Estimated Assessments Noticed	128,550,596	13,925,011	3,462,626	3,666,355	249,412	4,590,000	-	154,444,000
USDA Loan Repayment	3,478,505	376,803	93,697	99,209	6,749	124,203	-	4,179,165
SRF Loan Repayment	4,293,668	465,104	115,654	122,458	8,331	153,309	-	5,158,523
Total Annual Assessments	7,772,173	841,907	209,350	221,668	15,079	277,512	-	9,337,689
Annual Average per Account	*1,585.83*	*911.15*	*386.26*	*1,319.45*	*2,513.24*	*14,605.87*	*-*	*1,277.56*
Monthly Average per Account	*132.15*	*75.93*	*32.19*	*109.95*	*209.44*	*1,217.16*	*-*	*106.46*
A G G R E G A T E C O S T S	13,210,677	1,335,888	415,545	423,939	25,605	370,003	17,722	15,799,380
Annual Average per Account	*2,853.85*	*1,521.76*	*766.69*	*2,695.44*	*4,618.40*	*20,046.57*	*23.66*	*2,262.87*
Monthly Average per Account	*237.82*	*126.81*	*63.89*	*224.62*	*384.87*	*1,670.55*	*1.97*	*188.57*

** independent financing for on-site connections is assumed to be available at 9.0% with 10-year level annual amortizing payments

COUNTY OF SAN LUIS OBISPO
LOS OSOS WASTEWATER PROJECT

ANNUAL WASTEWATER REVENUES AND CHARGES

Funding Scenario 4 - 2nd Assessment / USDA Grant

	Single Family Residential 4,289	Multi Family Residential 809	Mobile Homes 542	Low-Load Non Residential 147	Med-Load Non Residential 5	High-Load Non Residential 17	Special Users (Septage) 749	Aggregate 6,558
PERSONAL FINANCING								
On-Site Connections	4,076	40	5	147	5	17	-	
Connection Cost Factor	1.0	2.0	2.0	1.0	2.0	3.0	-	
Connection Equivalents	4,076	81	10	147	10	51	-	
Connection Cost per Goup	14,534,184	288,473	35,658	524,172	35,658	181,856	-	15,600,000
** Annual On-Site Connections Pmts	2,264,718	44,950	5,556	81,677	5,556	28,337	-	2,430,793
Annual Average per Account	*528.03*	*55.56*	*10.25*	*555.62*	*1,111.25*	*1,666.87*	-	*370.66*
Monthly Average per Account	*44.00*	*4.63*	*0.85*	*46.30*	*92.60*	*138.91*	-	*30.89*
PROJECT REVENUES								
Variable OM&R Costs	446,099	63,115	28,201	16,950	633	8,008	1,994	565,000
Fixed OM&R Costs	1,416,592	200,421	89,553	53,826	2,462	32,385	9,759	1,805,000
Capital Replacement Fund	158,306	22,397	10,008	6,015	204	2,521	549	200,000
Operational/Replacement Costs	2,020,997	285,933	127,762	76,792	3,299	42,915	12,302	2,570,000
SRF Loan Repayment	355,561	50,305	22,478	13,510	508	6,435	1,614	450,411
SRF Debt Reserve Fund	35,399	5,008	2,238	1,345	59	769	224	45,041
Operations and Debt Service	2,411,957	341,247	152,477	91,647	3,865	50,118	14,140	3,065,452
Annual Average per Account	*562.36*	*421.81*	*281.32*	*623.45*	*773.08*	*2,948.14*	*18.88*	*467.44*
Monthly Average per Account	*46.86*	*35.15*	*23.44*	*51.95*	*64.42*	*245.68*	*1.57*	*38.95*
ASSESSMENTS Accounts	4,901	924	542	168	6	19	749	7,309
Estimated Assessments Noticed	128,550,596	13,925,011	3,462,626	3,666,355	249,412	4,590,000	-	154,444,000
USDA Loan Repayment	2,782,804	301,442	74,957	79,368	5,399	99,362	-	3,343,332
SRF Loan Repayment	5,024,198	544,237	135,331	143,294	9,748	179,393	-	6,036,201
Total Annual Assessments	7,807,002	845,679	210,289	222,661	15,147	278,755	-	9,379,533
Annual Average per Account	*1,592.94*	*915.24*	*387.99*	*1,325.36*	*2,524.50*	*14,671.32*	-	*1,283.29*
Monthly Average per Account	*132.75*	*76.27*	*32.33*	*110.45*	*210.38*	*1,222.61*	-	*106.94*
AGGREGATE COSTS	12,483,677	1,231,876	368,322	395,985	24,569	357,210	14,140	14,875,779
Annual Average per Account	*2,683.33*	*1,392.61*	*679.56*	*2,504.44*	*4,408.83*	*19,286.33*	*18.88*	*2,121.38*
Monthly Average per Account	*223.61*	*116.05*	*56.63*	*208.70*	*367.40*	*1,607.19*	*1.57*	*176.78*

** independent financing for on-site connections is assumed to be available at 9.0% with 10-year level annual amortizing payments

Exhibit C - Loan Drawdown Assumptions

SRF Loan	I
USDA Loan – with no Grant	II
USDA Loan – with 20% Grant	III

new SRF loan	93,610,000	acc'd int	2,894,413
Defaulted SRF repmt	6,500,000	principal	93,610,000
project exp	87,110,000	acc'd balance	96,504,413

SRF Loan

Months	Unused Balance	SRF Draw	Aggregate Draws	3.00% Draws	accrued interest
0.	93,610,000	-	-	-	
1.	93,610,000	-	-	-	
2.	93,610,000	-	-	-	
3.	93,610,000	-	-	-	
4.	93,610,000	-	-	-	
5.	93,610,000	-	-	-	
6.	93,610,000	-	-	-	
7.	93,610,000	-	-	-	
8.	93,610,000	-	-	-	
9.	93,610,000	-	-	-	
10.	93,610,000	-	-	-	
11.	93,610,000	-	-	-	
12.	87,110,000	6,500,000	6,500,000	-	-
13.	83,480,417	3,629,583	10,129,583	16,250	
14.	79,850,833	3,629,583	13,759,167	25,324	
15.	76,221,250	3,629,583	17,388,750	34,398	
16.	72,591,667	3,629,583	21,018,333	43,472	
17.	68,962,083	3,629,583	24,647,917	52,546	
18.	65,332,500	3,629,583	28,277,500	61,620	
19.	61,702,917	3,629,583	31,907,083	70,694	
20.	58,073,333	3,629,583	35,536,667	79,768	
21.	54,443,750	3,629,583	39,166,250	88,842	
22.	50,814,167	3,629,583	42,795,833	97,916	
23.	47,184,583	3,629,583	46,425,417	106,990	
24.	43,555,000	3,629,583	50,055,000	116,064	793,881
25.	39,925,417	3,629,583	53,684,583	125,138	
26.	36,295,833	3,629,583	57,314,167	134,211	
27.	32,666,250	3,629,583	60,943,750	143,285	
28.	29,036,667	3,629,583	64,573,333	152,359	
29.	25,407,083	3,629,583	68,202,917	161,433	
30.	21,777,500	3,629,583	71,832,500	170,507	
31.	18,147,917	3,629,583	75,462,083	179,581	
32.	14,518,333	3,629,583	79,091,667	188,655	
33.	10,888,750	3,629,583	82,721,250	197,729	
34.	7,259,167	3,629,583	86,350,833	206,803	
35.	3,629,583	3,629,583	89,980,417	215,877	
36.	-	3,629,583	93,610,000	224,951	2,100,531
		93,610,000		2,894,413	2,894,413

USDA loan	64,000,000		funding amt	80,000,000
USDA grant	16,000,000		county repmt	22,610,000
USDA funding	80,000,000		rem'g balance	57,390,000

USDA Loan and Grant

Months	Unused Balance	USDA Draw	Aggregate Loan Draws	Aggregate Grant Draws	4.00% Draws	semi-ann. interest	annual interest
0.	57,390,000	22,610,000	22,610,000	-			
1.	55,795,833	1,594,167	24,204,167	-	75,367		
2.	54,201,667	1,594,167	25,798,333	-	80,681		
3.	52,607,500	1,594,167	27,392,500	-	85,994		
4.	51,013,333	1,594,167	28,986,667	-	91,308		
5.	49,419,167	1,594,167	30,580,833	-	96,622		
6.	47,825,000	1,594,167	32,175,000	-	101,936	531,908	
7.	46,230,833	1,594,167	33,769,167	-	107,250		
8.	44,636,667	1,594,167	35,363,333	-	112,564		
9.	43,042,500	1,594,167	36,957,500	-	117,878		
10.	41,448,333	1,594,167	38,551,667	-	123,192		
11.	39,854,167	1,594,167	40,145,833	-	128,506		
12.	38,260,000	1,594,167	41,740,000	-	133,819	723,208	1,255,117
13.	36,665,833	1,594,167	43,334,167	-	139,133		
14.	35,071,667	1,594,167	44,928,333	-	144,447		
15.	33,477,500	1,594,167	46,522,500	-	149,761		
16.	31,883,333	1,594,167	48,116,667	-	155,075		
17.	30,289,167	1,594,167	49,710,833	-	160,389		
18.	28,695,000	1,594,167	51,305,000	-	165,703	914,508	
19.	27,100,833	1,594,167	52,899,167	-	171,017		
20.	25,506,667	1,594,167	54,493,333	-	176,331		
21.	23,912,500	1,594,167	56,087,500	-	181,644		
22.	22,318,333	1,594,167	57,681,667	-	186,958		
23.	20,724,167	1,594,167	59,275,833	-	192,272		
24.	19,130,000	1,594,167	60,870,000	-	197,586	1,105,808	2,020,317
25.	17,535,833	1,594,167	62,464,167	-	202,900		
26.	15,941,667	1,594,167	64,000,000	58,333	208,214		
27.	14,347,500	1,594,167	64,000,000	1,652,500	213,333		
28.	12,753,333	1,594,167	64,000,000	3,246,667	213,333		
29.	11,159,167	1,594,167	64,000,000	4,840,833	213,333		
30.	9,565,000	1,594,167	64,000,000	6,435,000	213,333	1,264,447	
31.	7,970,833	1,594,167	64,000,000	8,029,167	213,333		
32.	6,376,667	1,594,167	64,000,000	9,623,333	213,333		
33.	4,782,500	1,594,167	64,000,000	11,217,500	213,333		
34.	3,188,333	1,594,167	64,000,000	12,811,667	213,333		
35.	1,594,167	1,594,167	64,000,000	14,405,833	213,333		
36.	0	1,594,167	64,000,000	16,000,000	213,333	1,280,000	2,544,447
		80,000,000			5,819,881	5,819,881	5,819,881

USDA loan	80,000,000		funding amt	80,000,000
USDA grant	-		county repmt	22,610,000
USDA funding	80,000,000		rem'g balance	57,390,000

USDA Loan Only

Months	Unused Balance	USDA Draw	Aggregate Loan Draws	4.00% Draws	semi-ann. interest	annual interest
0.	57,390,000	22,610,000	22,610,000			
1.	55,795,833	1,594,167	24,204,167	75,367		
2.	54,201,667	1,594,167	25,798,333	80,681		
3.	52,607,500	1,594,167	27,392,500	85,994		
4.	51,013,333	1,594,167	28,986,667	91,308		
5.	49,419,167	1,594,167	30,580,833	96,622		
6.	47,825,000	1,594,167	32,175,000	101,936	531,908	
7.	46,230,833	1,594,167	33,769,167	107,250		
8.	44,636,667	1,594,167	35,363,333	112,564		
9.	43,042,500	1,594,167	36,957,500	117,878		
10.	41,448,333	1,594,167	38,551,667	123,192		
11.	39,854,167	1,594,167	40,145,833	128,506		
12.	38,260,000	1,594,167	41,740,000	133,819	723,208	1,255,117
13.	36,665,833	1,594,167	43,334,167	139,133		
14.	35,071,667	1,594,167	44,928,333	144,447		
15.	33,477,500	1,594,167	46,522,500	149,761		
16.	31,883,333	1,594,167	48,116,667	155,075		
17.	30,289,167	1,594,167	49,710,833	160,389		
18.	28,695,000	1,594,167	51,305,000	165,703	914,508	
19.	27,100,833	1,594,167	52,899,167	171,017		
20.	25,506,667	1,594,167	54,493,333	176,331		
21.	23,912,500	1,594,167	56,087,500	181,644		
22.	22,318,333	1,594,167	57,681,667	186,958		
23.	20,724,167	1,594,167	59,275,833	192,272		
24.	19,130,000	1,594,167	60,870,000	197,586	1,105,808	2,020,317
25.	17,535,833	1,594,167	62,464,167	202,900		
26.	15,941,667	1,594,167	64,058,333	208,214		
27.	14,347,500	1,594,167	65,652,500	213,528		
28.	12,753,333	1,594,167	67,246,667	218,842		
29.	11,159,167	1,594,167	68,840,833	224,156		
30.	9,565,000	1,594,167	70,435,000	229,469	1,297,108	
31.	7,970,833	1,594,167	72,029,167	234,783		
32.	6,376,667	1,594,167	73,623,333	240,097		
33.	4,782,500	1,594,167	75,217,500	245,411		
34.	3,188,333	1,594,167	76,811,667	250,725		
35.	1,594,167	1,594,167	78,405,833	256,039		
36.	0	1,594,167	80,000,000	261,353	1,488,408	2,785,517
		80,000,000		6,060,950	6,060,950	6,060,950

Exhibit D - Loan Repayment Scenarios:

Scenario 1 – No 2nd Assessment / No USDA Grant I

		SRF Loan				
		Amount	93,610,000		Assess'ts	126,722,296
		Rate	3.00%		USDA Loan	80,000,000
		Const'n - level	24	months		46,722,296
		Gross Loan	96,504,413			
		Term	20	years	required	6,500,000
		Annual Pmt	6,486,612		46,722,296	46,887,704
					49.9%	50.1%
Years	Balance	Principal	Interest	Debt Svc	Ass'ment	Revenues
0.	-					
1.	93,610,000					
2.	94,403,881					
3.	96,504,413					
4.	92,912,933	3,591,480	2,895,132	6,486,612	3,237,575	3,249,037
5.	89,213,708	3,699,224	2,787,388	6,486,612	3,237,575	3,249,037
6.	85,403,507	3,810,201	2,676,411	6,486,612	3,237,575	3,249,037
7.	81,479,000	3,924,507	2,562,105	6,486,612	3,237,575	3,249,037
8.	77,436,757	4,042,242	2,444,370	6,486,612	3,237,575	3,249,037
9.	73,273,248	4,163,510	2,323,103	6,486,612	3,237,575	3,249,037
10.	68,984,833	4,288,415	2,198,197	6,486,612	3,237,575	3,249,037
11.	64,567,765	4,417,067	2,069,545	6,486,612	3,237,575	3,249,037
12.	60,018,186	4,549,579	1,937,033	6,486,612	3,237,575	3,249,037
13.	55,332,119	4,686,067	1,800,546	6,486,612	3,237,575	3,249,037
14.	50,505,470	4,826,649	1,659,964	6,486,612	3,237,575	3,249,037
15.	45,534,022	4,971,448	1,515,164	6,486,612	3,237,575	3,249,037
16.	40,413,431	5,120,592	1,366,021	6,486,612	3,237,575	3,249,037
17.	35,139,221	5,274,209	1,212,403	6,486,612	3,237,575	3,249,037
18.	29,706,785	5,432,436	1,054,177	6,486,612	3,237,575	3,249,037
19.	24,111,376	5,595,409	891,204	6,486,612	3,237,575	3,249,037
20.	18,348,105	5,763,271	723,341	6,486,612	3,237,575	3,249,037
21.	12,411,936	5,936,169	550,443	6,486,612	3,237,575	3,249,037
22.	6,297,682	6,114,254	372,358	6,486,612	3,237,575	3,249,037
23.	(0)	6,297,682	188,930	6,486,612	3,237,575	3,249,037
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		96,504,413	33,227,835	129,732,247	64,751,506	64,980,742

USDA Loan

Amount	80,000,000
Rate	4.00%
Term	40 years
Annual Pmt	4,179,165
Interest Only	3 years

					USDA Loan Repayment	
					80,000,000	-
					100%	0%
Years	Balance	Principal	Interest	Debt Svc	Ass'ment	Revenues
0.	80,000,000					
1.	80,000,000	-	1,255,117	1,255,117	1,255,117	-
2.	80,000,000	-	2,020,317	2,020,317	2,020,317	-
3.	80,000,000	-	2,785,517	2,785,517	2,785,517	-
4.	79,020,835	979,165	3,200,000	4,179,165	4,179,165	-
5.	78,002,503	1,018,332	3,160,833	4,179,165	4,179,165	-
6.	76,943,438	1,059,065	3,120,100	4,179,165	4,179,165	-
7.	75,842,010	1,101,428	3,077,738	4,179,165	4,179,165	-
8.	74,696,525	1,145,485	3,033,680	4,179,165	4,179,165	-
9.	73,505,221	1,191,304	2,987,861	4,179,165	4,179,165	-
10.	72,266,265	1,238,956	2,940,209	4,179,165	4,179,165	-
11.	70,977,750	1,288,515	2,890,651	4,179,165	4,179,165	-
12.	69,637,695	1,340,055	2,839,110	4,179,165	4,179,165	-
13.	68,244,037	1,393,657	2,785,508	4,179,165	4,179,165	-
14.	66,794,633	1,449,404	2,729,761	4,179,165	4,179,165	-
15.	65,287,254	1,507,380	2,671,785	4,179,165	4,179,165	-
16.	63,719,578	1,567,675	2,611,490	4,179,165	4,179,165	-
17.	62,089,196	1,630,382	2,548,783	4,179,165	4,179,165	-
18.	60,393,599	1,695,597	2,483,568	4,179,165	4,179,165	-
19.	58,630,178	1,763,421	2,415,744	4,179,165	4,179,165	-
20.	56,796,220	1,833,958	2,345,207	4,179,165	4,179,165	-
21.	54,888,903	1,907,316	2,271,849	4,179,165	4,179,165	-
22.	52,905,294	1,983,609	2,195,556	4,179,165	4,179,165	-
23.	50,842,340	2,062,953	2,116,212	4,179,165	4,179,165	-
24.	48,696,869	2,145,472	2,033,694	4,179,165	4,179,165	-
25.	46,465,578	2,231,290	1,947,875	4,179,165	4,179,165	-
26.	44,145,036	2,320,542	1,858,623	4,179,165	4,179,165	-
27.	41,731,672	2,413,364	1,765,801	4,179,165	4,179,165	-
28.	39,221,774	2,509,898	1,669,267	4,179,165	4,179,165	-
29.	36,611,480	2,610,294	1,568,871	4,179,165	4,179,165	-
30.	33,896,774	2,714,706	1,464,459	4,179,165	4,179,165	-
31.	31,073,479	2,823,294	1,355,871	4,179,165	4,179,165	-
32.	28,137,253	2,936,226	1,242,939	4,179,165	4,179,165	-
33.	25,083,578	3,053,675	1,125,490	4,179,165	4,179,165	-
34.	21,907,756	3,175,822	1,003,343	4,179,165	4,179,165	-
35.	18,604,901	3,302,855	876,310	4,179,165	4,179,165	-
36.	15,169,932	3,434,969	744,196	4,179,165	4,179,165	-
37.	11,597,564	3,572,368	606,797	4,179,165	4,179,165	-
38.	7,882,301	3,715,263	463,903	4,179,165	4,179,165	-
39.	4,018,428	3,863,873	315,292	4,179,165	4,179,165	-
40.	0	4,018,428	160,737	4,179,165	4,179,165	-
		80,000,000	80,690,064	160,690,064	160,690,064	-

Scenario 1 – No 2nd Assessment / No USDA Grant
Annual Debt Service

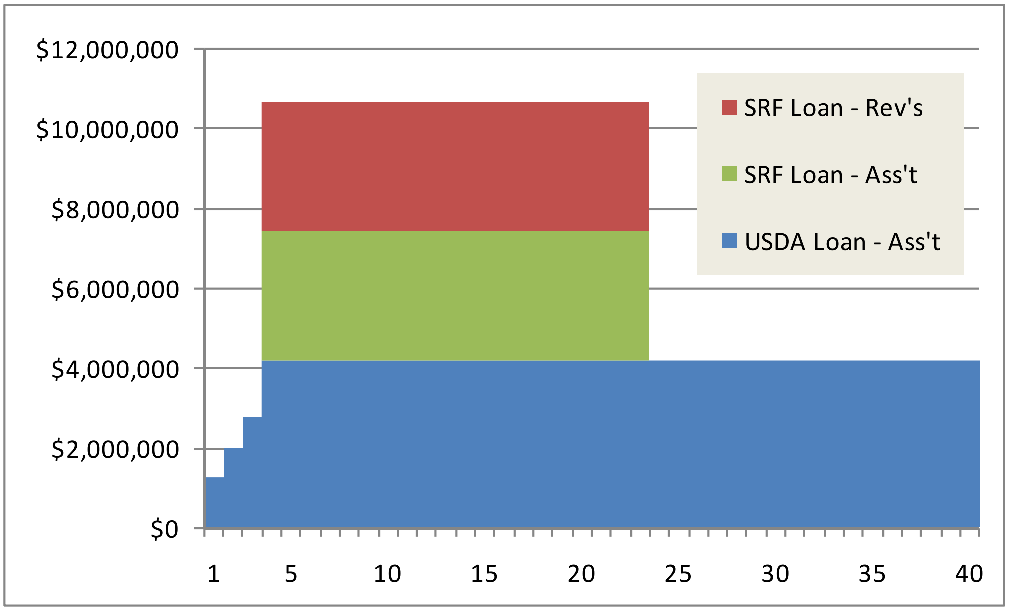

Exhibit D - Loan Repayment Scenarios:

Scenario 2 – No 2^{nd} Assessment / USDA Grant II

SRF Loan

		Amount	93,610,000		Assess'ts	126,722,296
		Rate	3.00%		USDA Loan	64,000,000
		Const'n - level	24	months		62,722,296
		Gross Loan	96,504,413			
		Term	20	years	required	6,500,000
		Annual Pmt	6,486,612		62,722,296	30,887,704
					67.0%	33.0%

Years	Balance	Principal	Interest	Debt Svc	Ass'ment	Revenues
0.	-					
1.	93,610,000					
2.	94,403,881					
3.	96,504,413					
4.	92,912,933	3,591,480	2,895,132	6,486,612	4,346,279	2,140,333
5.	89,213,708	3,699,224	2,787,388	6,486,612	4,346,279	2,140,333
6.	85,403,507	3,810,201	2,676,411	6,486,612	4,346,279	2,140,333
7.	81,479,000	3,924,507	2,562,105	6,486,612	4,346,279	2,140,333
8.	77,436,757	4,042,242	2,444,370	6,486,612	4,346,279	2,140,333
9.	73,273,248	4,163,510	2,323,103	6,486,612	4,346,279	2,140,333
10.	68,984,833	4,288,415	2,198,197	6,486,612	4,346,279	2,140,333
11.	64,567,765	4,417,067	2,069,545	6,486,612	4,346,279	2,140,333
12.	60,018,186	4,549,579	1,937,033	6,486,612	4,346,279	2,140,333
13.	55,332,119	4,686,067	1,800,546	6,486,612	4,346,279	2,140,333
14.	50,505,470	4,826,649	1,659,964	6,486,612	4,346,279	2,140,333
15.	45,534,022	4,971,448	1,515,164	6,486,612	4,346,279	2,140,333
16.	40,413,431	5,120,592	1,366,021	6,486,612	4,346,279	2,140,333
17.	35,139,221	5,274,209	1,212,403	6,486,612	4,346,279	2,140,333
18.	29,706,785	5,432,436	1,054,177	6,486,612	4,346,279	2,140,333
19.	24,111,376	5,595,409	891,204	6,486,612	4,346,279	2,140,333
20.	18,348,105	5,763,271	723,341	6,486,612	4,346,279	2,140,333
21.	12,411,936	5,936,169	550,443	6,486,612	4,346,279	2,140,333
22.	6,297,682	6,114,254	372,358	6,486,612	4,346,279	2,140,333
23.	(0)	6,297,682	188,930	6,486,612	4,346,279	2,140,333
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		96,504,413	33,227,835	129,732,247	86,925,589	42,806,658

USDA Loan

Amount	64,000,000		
Rate	4.00%		
Term	40	years	
Annual Pmt	3,343,332		
Interest Only	3	years	

					USDA Loan Repayment	
					64,000,000	-
					100%	0%
Years	Balance	Principal	Interest	Debt Svc	Ass'ment	Revenues
0.	64,000,000					
1.	64,000,000	-	1,255,117	1,255,117	1,255,117	-
2.	64,000,000	-	2,020,317	2,020,317	2,020,317	-
3.	64,000,000	-	2,544,447	2,544,447	2,544,447	-
4.	63,216,668	783,332	2,560,000	3,343,332	3,343,332	-
5.	62,402,002	814,665	2,528,667	3,343,332	3,343,332	-
6.	61,554,750	847,252	2,496,080	3,343,332	3,343,332	-
7.	60,673,608	881,142	2,462,190	3,343,332	3,343,332	-
8.	59,757,220	916,388	2,426,944	3,343,332	3,343,332	-
9.	58,804,177	953,043	2,390,289	3,343,332	3,343,332	-
10.	57,813,012	991,165	2,352,167	3,343,332	3,343,332	-
11.	56,782,200	1,030,812	2,312,520	3,343,332	3,343,332	-
12.	55,710,156	1,072,044	2,271,288	3,343,332	3,343,332	-
13.	54,595,230	1,114,926	2,228,406	3,343,332	3,343,332	-
14.	53,435,707	1,159,523	2,183,809	3,343,332	3,343,332	-
15.	52,229,803	1,205,904	2,137,428	3,343,332	3,343,332	-
16.	50,975,663	1,254,140	2,089,192	3,343,332	3,343,332	-
17.	49,671,357	1,304,306	2,039,027	3,343,332	3,343,332	-
18.	48,314,879	1,356,478	1,986,854	3,343,332	3,343,332	-
19.	46,904,142	1,410,737	1,932,595	3,343,332	3,343,332	-
20.	45,436,976	1,467,167	1,876,166	3,343,332	3,343,332	-
21.	43,911,122	1,525,853	1,817,479	3,343,332	3,343,332	-
22.	42,324,235	1,586,887	1,756,445	3,343,332	3,343,332	-
23.	40,673,872	1,650,363	1,692,969	3,343,332	3,343,332	-
24.	38,957,495	1,716,377	1,626,955	3,343,332	3,343,332	-
25.	37,172,463	1,785,032	1,558,300	3,343,332	3,343,332	-
26.	35,316,029	1,856,434	1,486,899	3,343,332	3,343,332	-
27.	33,385,338	1,930,691	1,412,641	3,343,332	3,343,332	-
28.	31,377,419	2,007,919	1,335,414	3,343,332	3,343,332	-
29.	29,289,184	2,088,235	1,255,097	3,343,332	3,343,332	-
30.	27,117,419	2,171,765	1,171,567	3,343,332	3,343,332	-
31.	24,858,784	2,258,635	1,084,697	3,343,332	3,343,332	-
32.	22,509,803	2,348,981	994,351	3,343,332	3,343,332	-
33.	20,066,863	2,442,940	900,392	3,343,332	3,343,332	-
34.	17,526,205	2,540,658	802,675	3,343,332	3,343,332	-
35.	14,883,921	2,642,284	701,048	3,343,332	3,343,332	-
36.	12,135,946	2,747,975	595,357	3,343,332	3,343,332	-
37.	9,278,051	2,857,894	485,438	3,343,332	3,343,332	-
38.	6,305,841	2,972,210	371,122	3,343,332	3,343,332	-
39.	3,214,742	3,091,099	252,234	3,343,332	3,343,332	-
40.	0	3,214,742	128,590	3,343,332	3,343,332	-
		64,000,000	65,523,172	129,523,172	129,523,172	-

Scenario 2 – No 2nd Assessment / USDA Grant
Annual Debt Service

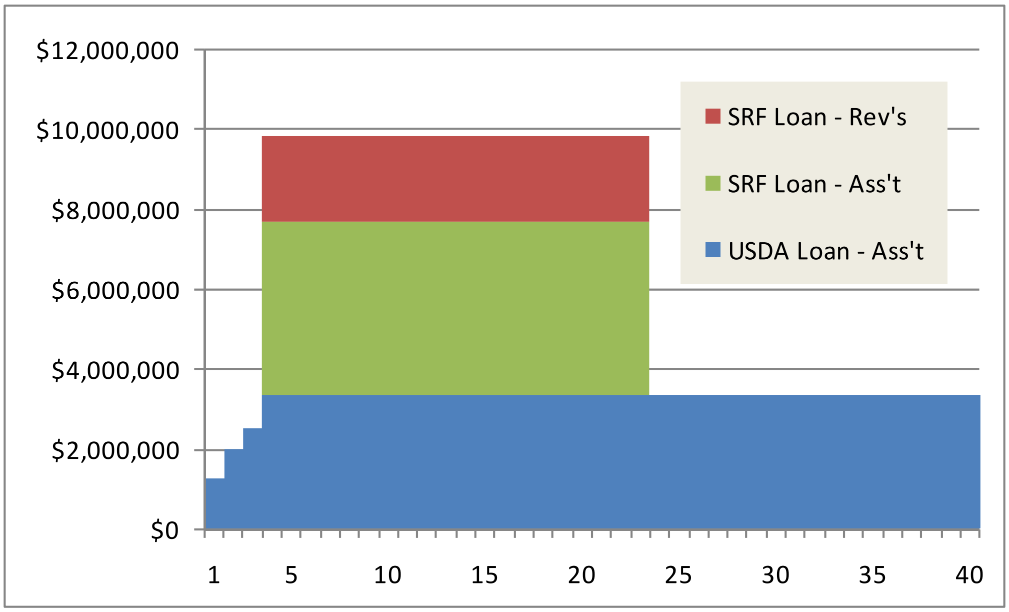

Exhibit D - Loan Repayment Scenarios:

SRF Loan						
		Amount	93,610,000		Assess'ts	154,444,000
		Rate	3.00%		USDA Loan	80,000,000
		Const'n - level	24	months		74,444,000
		Gross Loan	96,504,413			
		Term	20	years	required	6,500,000
		Annual Pmt	6,486,612		74,444,000	19,166,000
					79.5%	20.5%

Years	Balance	Principal	Interest	Debt Svc	Ass'ment	Revenues
0.	-					
1.	93,610,000					
2.	94,403,881					
3.	96,504,413					
4.	92,912,933	3,591,480	2,895,132	6,486,612	5,158,523	1,328,089
5.	89,213,708	3,699,224	2,787,388	6,486,612	5,158,523	1,328,089
6.	85,403,507	3,810,201	2,676,411	6,486,612	5,158,523	1,328,089
7.	81,479,000	3,924,507	2,562,105	6,486,612	5,158,523	1,328,089
8.	77,436,757	4,042,242	2,444,370	6,486,612	5,158,523	1,328,089
9.	73,273,248	4,163,510	2,323,103	6,486,612	5,158,523	1,328,089
10.	68,984,833	4,288,415	2,198,197	6,486,612	5,158,523	1,328,089
11.	64,567,765	4,417,067	2,069,545	6,486,612	5,158,523	1,328,089
12.	60,018,186	4,549,579	1,937,033	6,486,612	5,158,523	1,328,089
13.	55,332,119	4,686,067	1,800,546	6,486,612	5,158,523	1,328,089
14.	50,505,470	4,826,649	1,659,964	6,486,612	5,158,523	1,328,089
15.	45,534,022	4,971,448	1,515,164	6,486,612	5,158,523	1,328,089
16.	40,413,431	5,120,592	1,366,021	6,486,612	5,158,523	1,328,089
17.	35,139,221	5,274,209	1,212,403	6,486,612	5,158,523	1,328,089
18.	29,706,785	5,432,436	1,054,177	6,486,612	5,158,523	1,328,089
19.	24,111,376	5,595,409	891,204	6,486,612	5,158,523	1,328,089
20.	18,348,105	5,763,271	723,341	6,486,612	5,158,523	1,328,089
21.	12,411,936	5,936,169	550,443	6,486,612	5,158,523	1,328,089
22.	6,297,682	6,114,254	372,358	6,486,612	5,158,523	1,328,089
23.	(0)	6,297,682	188,930	6,486,612	5,158,523	1,328,089
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		96,504,413	33,227,835	129,732,247	103,170,467	26,561,780

		USDA Loan				
		Amount	80,000,000			
		Rate	4.00%			
		Term	40	years		
		Annual Pmt	4,179,165			
		Interest Only	3	years	USDA Loan Repayment	
					80,000,000	-
					100%	0%
Years	Balance	Principal	Interest	Debt Svc	Ass'ment	Revenues
0.	80,000,000					
1.	80,000,000	-	1,255,117	1,255,117	1,255,117	-
2.	80,000,000	-	2,020,317	2,020,317	2,020,317	-
3.	80,000,000	-	2,785,517	2,785,517	2,785,517	-
4.	79,020,835	979,165	3,200,000	4,179,165	4,179,165	-
5.	78,002,503	1,018,332	3,160,833	4,179,165	4,179,165	-
6.	76,943,438	1,059,065	3,120,100	4,179,165	4,179,165	-
7.	75,842,010	1,101,428	3,077,738	4,179,165	4,179,165	-
8.	74,696,525	1,145,485	3,033,680	4,179,165	4,179,165	-
9.	73,505,221	1,191,304	2,987,861	4,179,165	4,179,165	-
10.	72,266,265	1,238,956	2,940,209	4,179,165	4,179,165	-
11.	70,977,750	1,288,515	2,890,651	4,179,165	4,179,165	-
12.	69,637,695	1,340,055	2,839,110	4,179,165	4,179,165	-
13.	68,244,037	1,393,657	2,785,508	4,179,165	4,179,165	-
14.	66,794,633	1,449,404	2,729,761	4,179,165	4,179,165	-
15.	65,287,254	1,507,380	2,671,785	4,179,165	4,179,165	-
16.	63,719,578	1,567,675	2,611,490	4,179,165	4,179,165	-
17.	62,089,196	1,630,382	2,548,783	4,179,165	4,179,165	-
18.	60,393,599	1,695,597	2,483,568	4,179,165	4,179,165	-
19.	58,630,178	1,763,421	2,415,744	4,179,165	4,179,165	-
20.	56,796,220	1,833,958	2,345,207	4,179,165	4,179,165	-
21.	54,888,903	1,907,316	2,271,849	4,179,165	4,179,165	-
22.	52,905,294	1,983,609	2,195,556	4,179,165	4,179,165	-
23.	50,842,340	2,062,953	2,116,212	4,179,165	4,179,165	-
24.	48,696,869	2,145,472	2,033,694	4,179,165	4,179,165	-
25.	46,465,578	2,231,290	1,947,875	4,179,165	4,179,165	-
26.	44,145,036	2,320,542	1,858,623	4,179,165	4,179,165	-
27.	41,731,672	2,413,364	1,765,801	4,179,165	4,179,165	-
28.	39,221,774	2,509,898	1,669,267	4,179,165	4,179,165	-
29.	36,611,480	2,610,294	1,568,871	4,179,165	4,179,165	-
30.	33,896,774	2,714,706	1,464,459	4,179,165	4,179,165	-
31.	31,073,479	2,823,294	1,355,871	4,179,165	4,179,165	-
32.	28,137,253	2,936,226	1,242,939	4,179,165	4,179,165	-
33.	25,083,578	3,053,675	1,125,490	4,179,165	4,179,165	-
34.	21,907,756	3,175,822	1,003,343	4,179,165	4,179,165	-
35.	18,604,901	3,302,855	876,310	4,179,165	4,179,165	-
36.	15,169,932	3,434,969	744,196	4,179,165	4,179,165	-
37.	11,597,564	3,572,368	606,797	4,179,165	4,179,165	-
38.	7,882,301	3,715,263	463,903	4,179,165	4,179,165	-
39.	4,018,428	3,863,873	315,292	4,179,165	4,179,165	-
40.	0	4,018,428	160,737	4,179,165	4,179,165	-
		80,000,000	80,690,064	160,690,064	160,690,064	-

Scenario 3 – 2nd Assessment / No USDA Grant
Annual Debt Service

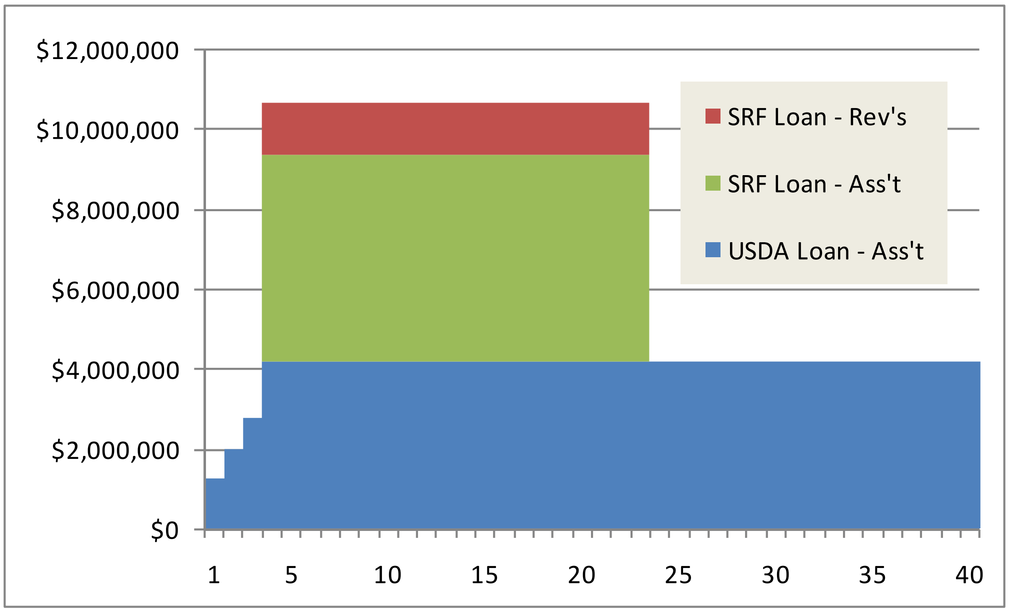

Exhibit D - Loan Repayment Scenarios:

SRF Loan

		Amount	93,610,000		Assess'ts	154,444,000
		Rate	3.00%		USDA Loan	64,000,000
		Const'n - level	24	months		90,444,000
		Gross Loan	96,504,413			
		Term	20	years	required	6,500,000
		Annual Pmt	6,486,612		87,110,000	6,500,000
					93.1%	6.9%

Years	Balance	Principal	Interest	Debt Svc	Ass'ment	Revenues
0.	-					
1.	93,610,000					
2.	94,403,881					
3.	96,504,413					
4.	92,912,933	3,591,480	2,895,132	6,486,612	6,036,201	450,411
5.	89,213,708	3,699,224	2,787,388	6,486,612	6,036,201	450,411
6.	85,403,507	3,810,201	2,676,411	6,486,612	6,036,201	450,411
7.	81,479,000	3,924,507	2,562,105	6,486,612	6,036,201	450,411
8.	77,436,757	4,042,242	2,444,370	6,486,612	6,036,201	450,411
9.	73,273,248	4,163,510	2,323,103	6,486,612	6,036,201	450,411
10.	68,984,833	4,288,415	2,198,197	6,486,612	6,036,201	450,411
11.	64,567,765	4,417,067	2,069,545	6,486,612	6,036,201	450,411
12.	60,018,186	4,549,579	1,937,033	6,486,612	6,036,201	450,411
13.	55,332,119	4,686,067	1,800,546	6,486,612	6,036,201	450,411
14.	50,505,470	4,826,649	1,659,964	6,486,612	6,036,201	450,411
15.	45,534,022	4,971,448	1,515,164	6,486,612	6,036,201	450,411
16.	40,413,431	5,120,592	1,366,021	6,486,612	6,036,201	450,411
17.	35,139,221	5,274,209	1,212,403	6,486,612	6,036,201	450,411
18.	29,706,785	5,432,436	1,054,177	6,486,612	6,036,201	450,411
19.	24,111,376	5,595,409	891,204	6,486,612	6,036,201	450,411
20.	18,348,105	5,763,271	723,341	6,486,612	6,036,201	450,411
21.	12,411,936	5,936,169	550,443	6,486,612	6,036,201	450,411
22.	6,297,682	6,114,254	372,358	6,486,612	6,036,201	450,411
23.	(0)	6,297,682	188,930	6,486,612	6,036,201	450,411
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		96,504,413	33,227,835	129,732,247	120,724,026	9,008,221

		USDA Loan				
		Amount	64,000,000			
		Rate	4.00%			
		Term	40	years		
		Annual Pmt	3,343,332			
		Interest Only	3	years	USDA Loan Repayment	
					64,000,000	-
					100%	0%
Years	Balance	Principal	Interest	Debt Svc	Ass'ment	Revenues
0.	64,000,000					
1.	64,000,000	-	1,255,117	1,255,117	1,255,117	-
2.	64,000,000	-	2,020,317	2,020,317	2,020,317	-
3.	64,000,000	-	2,544,447	2,544,447	2,544,447	-
4.	63,216,668	783,332	2,560,000	3,343,332	3,343,332	-
5.	62,402,002	814,665	2,528,667	3,343,332	3,343,332	-
6.	61,554,750	847,252	2,496,080	3,343,332	3,343,332	-
7.	60,673,608	881,142	2,462,190	3,343,332	3,343,332	-
8.	59,757,220	916,388	2,426,944	3,343,332	3,343,332	-
9.	58,804,177	953,043	2,390,289	3,343,332	3,343,332	-
10.	57,813,012	991,165	2,352,167	3,343,332	3,343,332	-
11.	56,782,200	1,030,812	2,312,520	3,343,332	3,343,332	-
12.	55,710,156	1,072,044	2,271,288	3,343,332	3,343,332	-
13.	54,595,230	1,114,926	2,228,406	3,343,332	3,343,332	-
14.	53,435,707	1,159,523	2,183,809	3,343,332	3,343,332	-
15.	52,229,803	1,205,904	2,137,428	3,343,332	3,343,332	-
16.	50,975,663	1,254,140	2,089,192	3,343,332	3,343,332	-
17.	49,671,357	1,304,306	2,039,027	3,343,332	3,343,332	-
18.	48,314,879	1,356,478	1,986,854	3,343,332	3,343,332	-
19.	46,904,142	1,410,737	1,932,595	3,343,332	3,343,332	-
20.	45,436,976	1,467,167	1,876,166	3,343,332	3,343,332	-
21.	43,911,122	1,525,853	1,817,479	3,343,332	3,343,332	-
22.	42,324,235	1,586,887	1,756,445	3,343,332	3,343,332	-
23.	40,673,872	1,650,363	1,692,969	3,343,332	3,343,332	-
24.	38,957,495	1,716,377	1,626,955	3,343,332	3,343,332	-
25.	37,172,463	1,785,032	1,558,300	3,343,332	3,343,332	-
26.	35,316,029	1,856,434	1,486,899	3,343,332	3,343,332	-
27.	33,385,338	1,930,691	1,412,641	3,343,332	3,343,332	-
28.	31,377,419	2,007,919	1,335,414	3,343,332	3,343,332	-
29.	29,289,184	2,088,235	1,255,097	3,343,332	3,343,332	-
30.	27,117,419	2,171,765	1,171,567	3,343,332	3,343,332	-
31.	24,858,784	2,258,635	1,084,697	3,343,332	3,343,332	-
32.	22,509,803	2,348,981	994,351	3,343,332	3,343,332	-
33.	20,066,863	2,442,940	900,392	3,343,332	3,343,332	-
34.	17,526,205	2,540,658	802,675	3,343,332	3,343,332	-
35.	14,883,921	2,642,284	701,048	3,343,332	3,343,332	-
36.	12,135,946	2,747,975	595,357	3,343,332	3,343,332	-
37.	9,278,051	2,857,894	485,438	3,343,332	3,343,332	-
38.	6,305,841	2,972,210	371,122	3,343,332	3,343,332	-
39.	3,214,742	3,091,099	252,234	3,343,332	3,343,332	-
40.	0	3,214,742	128,590	3,343,332	3,343,332	-
		64,000,000	65,523,172	129,523,172	129,523,172	-

Scenario 4 – 2nd Assessment / USDA Grant
Annual Debt Service

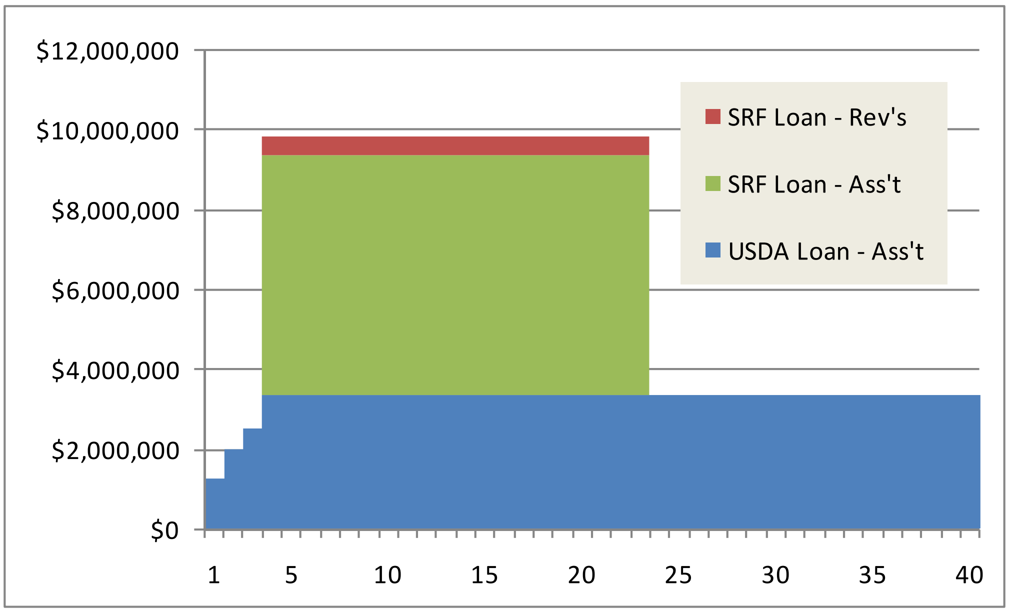

Exhibit E - Required Project Revenue Analysis:

Scenario 1 – No 2nd Assessment / No USDA Grant I

COUNTY OF SAN LUIS OBISPO
LOS OSOS WASTEWATER PROJECT

REQUIRED ANNUAL WASTEWATER REVENUES

Funding Scenario 1 - No 2nd Assessment / No USDA Grant

	Single Family Residential 4,289	Multi Family Residential 809	Mobile Homes 542	Low-Load Non Residential 147	Med-Load Non Residential 5	High-Load Non Residential 17	Special Users (Septage) 749	Aggregate Accounts 6,558
P R O J E C T R E V E N U E S								
Variable OM&R Costs	446,099	63,115	28,201	16,950	633	8,008	1,994	565,000
Fixed OM&R Costs	1,416,592	200,421	89,553	53,826	2,462	32,385	9,759	1,805,000
Capital Replacement Fund	158,306	22,397	10,008	6,015	204	2,521	549	200,000
Operational/Replacement Costs	2,020,997	285,933	127,762	76,792	3,299	42,915	12,302	2,570,000
SRF Loan Repayment	2,564,837	362,877	162,142	97,456	3,663	46,417	11,645	3,249,037
SRF Debt Reserve Fund	255,347	36,127	16,142	9,702	425	5,545	1,615	324,904
Debt Service Costs	2,820,184	399,004	178,284	107,158	4,088	51,962	13,260	3,573,941
Total Project Revenues	4,841,181	684,937	306,046	183,950	7,386	94,877	25,562	6,143,941
Annual Average per Account	*1,128.74*	*846.65*	*564.66*	*1,251.36*	*1,477.26*	*5,581.01*	*34.13*	*936.86*
Monthly Average per Amount	*94.06*	*70.55*	*47.06*	*104.28*	*123.10*	*465.08*	*2.84*	*78.07*

FORM 1 Summary of Users and Wastewater Characteristics

Agency: Los Osos - User Charges (O&M and General Benefits) FORM 1

Number of Accounts	USER GROUPS	DAILY ADWF Gal/Day	DAILY BOD ppm	DAILY SS ppm	DESIGN Volume MG/Yr	DESIGN BOD K*Lbs/Yr	DESIGN SS K*Lbs/Yr	ANNUAL Volume MG/Yr	ANNUAL BOD K*Lbs/Yr	ANNUAL SS K*Lbs/Yr
4,289	Single Family Residential	556,213	260	1	203.018	440.50	1.69	203.02	440.50	1.69
809	Multi Family Residential	78,694	260	1	28.723	62.32	0.24	28.72	62.32	0.24
542	Mobile Homes	35,162	260	1	12.834	27.85	0.11	12.83	27.85	0.11
147	Low-Load Non Residential	21,134	260	1	7.714	16.74	0.06	7.71	16.74	0.06
5	Medium-Load Non Residential	515	800	1	0.188	1.26	0.00	0.19	1.26	0.00
17	High-Load Non Residential	5,776	1,000	1	2.108	17.59	0.02	2.11	17.59	0.02
749	Special Users (Septage)	410	5,400	1	0.150	6.74	0.00	0.15	6.74	0.00
6,558	SUBTOTALS	697,904	270		254.735	573.00	2.13	254.73	573.00	2.13
	Special users									
	Special users II									
	Special users III									
	Special users IV									
	Infiltration/Inflow									
	Future flow	239,100						87.27	0.00	0.00
6,558	TOTALS	937,004	201	1	254.735	573.00	2.13	342.01	573.00	2.13

FORM 2 Annual O. M. & R. and Non-operating Costs

Agency: **Los Osos - User Charges (O&M and General Benefits)** FORM 2

Cost Category	Current Annual Costs	First Year Of Full Operation
1. TREATMENT FACILITIES:		
(a) Fixed O & M Costs (labor)		$400,000
(b) Variable O & M Costs (energy & hauling)		505,000
(c) Replacement Costs (maint, filters, solids)		625,000
(d) Subtotal Treatment	$0	$1,530,000
2. COLLECTION SYSTEM:		
(e) Fixed O & M Costs (labor)	$0	$170,000
(f) Variable O & M Costs (energy)	0	60,000
(g) Replacement Costs	0	200,000
(h) Subtotal Collection	$0	$430,000
3. MISCELLANEOUS:		
(i) Overhead/Indirect	$0	$300,000
(j) Operating Reserve	0	50,000
(k) Other (allowances, habitat mitigation)	0	60,000
(l) Subtotal Miscellaneous	$0	$410,000
4. TOTAL - Variable Costs	$0	$565,000
5. TOTAL - Fixed Costs	$0	$1,805,000
6. TOTAL O. M. & R. Costs:	$0	$2,370,000
7. CAPITAL REPLACEMENT FUND:		$200,000
8. DEBT SERVICE:		
(m) Collected with User Fees		$3,249,037
(n) Collected from Other Sources	0	
(o) Total debt service	$0	$3,249,037
9. WASTEWATER CAPITAL RESERVE FUND:		$324,904 *

* collected with User Fees

FORM 4 Unit Cost Determination

Agency: Los Osos - User Charges (O&M and General Benefits) FORM 4

COST RECOVERY	PARAMETER ALLOCATION PERCENTAGES	ANNUAL COST ALLOCATED TO EACH PARAMETER	TOTAL ANNUAL QUANTITIES EXC. INFILT/INFLOW AND FUTURE FLOW	UNIT COST FOR EACH PARAMETER
1. Variable O&M Costs				
(a) Flow	73.70%	$416,405	254.735	$1,634.66
(b) BOD	26.30%	148,595	573.001	$259.33
(c) SS	0.00%	0	2.126	$0.00
(d) I/I	0.00%	0		
(e) Other	0.00%	0		
	-	$565,000		
		-		
2. Fixed O & M Costs				
(f) Flow	56.90%	$1,027,045	254.735	$4,031.82
(g) BOD	43.10%	777,955	573.001	$1,357.68
(h) SS	0.00%	0	2.126	$0.00
(i) I/I	0.00%	0		
(j) Other	0.00%	0		
	-	$1,805,000		
		-		
3. Capital Replacement Fund				
(k) Flow	80.70%	$161,400	254.735	$633.60
(l) BOD	19.30%	38,600	573.001	$67.36
(m) SS	0.00%	0	2.126	$0.00
(n) I/I	0.00%	0		
(o) Other	0.00%	0		
	-	$200,000		
		-		
4. Wastewater Capital Reserve Fund				
(k) Flow	60.80%	$197,541	254.735	$775.48
(l) BOD	39.20%	127,362	573.001	$222.27
(m) SS	0.00%	0	2.126	$0.00
(n) I/I	0.00%	0		
(o) Other	0.00%	0		
	-	$324,904		
		-		
5. Wastewater Capital Reserve Fund				
(p) Flow	73.20%	$2,378,295	254.735	$9,336.35
(q) BOD	26.80%	870,742	573.001	$1,519.62
(r) SS	0.00%	0	2.126	$0.00
(s) I/I	0.00%	0		
(t) Other	0.00%	0		
	-	$3,249,037		
		-		

FORM 5v Summary of Variable Portion of O. M. & R. Costs.

Agency: Los Osos - User Charges (O&M and General Benefits) FORM 5v

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $1,634.66		BOD Unit Cost $/Klb = $259.33		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 331,865	440.50	$ 114,234	1.69	$ 0	$ 446,099
809	Multi Family Residential	28.72	46,953	62.32	16,162	0.24	0	63,115
542	Mobile Homes	12.83	20,980	27.85	7,222	0.11	0	28,201
147	Low-Load Non Residential	7.71	12,610	16.74	4,341	0.06	0	16,950
5	Medium-Load Non Residential	0.19	307	1.26	326	0.00	0	633
17	High-Load Non Residential	2.11	3,446	17.59	4,562	0.02	0	8,008
749	Special Users (Septage)	0.15	245	6.74	1,749	0.00	0	1,994
6,558	SUBTOTALS	254.73	$ 416,405	573.00	$ 148,595	2.13	$ 0	$ 565,000
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 416,405	573.00	$ 148,595	2.13	$ 0	$ 565,000

FORM 5F Summary of Fixed Portion of O. M. & R. Costs.

Agency: Los Osos - User Charges (O&M and General Benefits)

FORM 5f

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $4,031.82		BOD Unit Cost $/Klb = $1,357.68		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 818,530	440.50	$ 598,062	1.69	$ 0	$ 1,416,592
809	Multi Family Residential	28.72	115,807	62.32	84,615	0.24	0	200,421
542	Mobile Homes	12.83	51,745	27.85	37,808	0.11	0	89,553
147	Low-Load Non Residential	7.71	31,102	16.74	22,725	0.06	0	53,826
5	Medium-Load Non Residential	0.19	758	1.26	1,704	0.00	0	2,462
17	High-Load Non Residential	2.11	8,500	17.59	23,886	0.02	0	32,385
749	Special Users (Septage)	0.15	603	6.74	9,156	0.00	0	9,759
6,558	SUBTOTALS	254.73	$ 1,027,045	573.00	$ 777,955	2.13	$ 0	$ 1,805,000
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 1,027,045	573.00	$ 777,955	2.13	$ 0	$ 1,805,000

FORM 5c Summary of Capital Replacement Fund Costs.

Agency: Los Osos - User Charges (O&M and General Benefits)

FORM 5c

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $633.60		BOD Unit Cost $/Klb = $67.36		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 128,632	440.50	$ 29,674	1.69	$ 0	$ 158,306
809	Multi Family Residential	28.72	18,199	62.32	4,198	0.24	0	22,397
542	Mobile Homes	12.83	8,132	27.85	1,876	0.11	0	10,008
147	Low-Load Non Residential	7.71	4,888	16.74	1,128	0.06	0	6,015
5	Medium-Load Non Residential	0.19	119	1.26	85	0.00	0	204
17	High-Load Non Residential	2.11	1,336	17.59	1,185	0.02	0	2,521
749	Special Users (Septage)	0.15	95	6.74	454	0.00	0	549
6,558	SUBTOTALS	254.73	$ 161,400	573.00	$ 38,600	2.13	$ 0	$ 200,000
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 161,400	573.00	$ 38,600	2.13	$ 0	$ 200,000

FORM 5d Summary of Debt Service Fund Costs.

Agency: Los Osos - User Charges (O&M and General Benefits) **FORM 5d**

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $9,336.35		BOD Unit Cost $/Klb = $1,519.62		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 1,895,444	440.50	$ 669,393	1.69	$ 0	$ 2,564,837
809	Multi Family Residential	28.72	268,170	62.32	94,707	0.24	0	362,877
542	Mobile Homes	12.83	119,825	27.85	42,317	0.11	0	162,142
147	Low-Load Non Residential	7.71	72,021	16.74	25,435	0.06	0	97,456
5	Medium-Load Non Residential	0.19	1,755	1.26	1,907	0.00	0	3,663
17	High-Load Non Residential	2.11	19,682	17.59	26,735	0.02	0	46,417
749	Special Users (Septage)	0.15	1,397	6.74	10,248	0.00	0	11,645
6,558	SUBTOTALS	254.73	$ 2,378,295	573.00	$ 870,742	2.13	$ 0	$ 3,249,037
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 2,378,295	573.00	$ 870,742	2.13	$ 0	$ 3,249,037

FORM 5w Summary of Wastewater Capital Reserve Fund Fund Costs

Agency: Los Osos - User Charges (O&M and General Benefits)

FORM 5w

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $775.48		BOD Unit Cost $/Klb = $222.27		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 157,436	440.50	$ 97,911	1.69	$ 0	$ 255,347
809	Multi Family Residential	28.72	22,274	62.32	13,853	0.24	0	36,127
542	Mobile Homes	12.83	9,953	27.85	6,190	0.11	0	16,142
147	Low-Load Non Residential	7.71	5,982	16.74	3,720	0.06	0	9,702
5	Medium-Load Non Residential	0.19	146	1.26	279	0.00	0	425
17	High-Load Non Residential	2.11	1,635	17.59	3,910	0.02	0	5,545
749	Special Users (Septage)	0.15	116	6.74	1,499	0.00	0	1,615
6,558	SUBTOTALS	254.73	$ 197,541	573.00	$ 127,362	2.13	$ 0	$ 324,904
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 197,541	573.00	$ 127,362	2.13	$ 0	$ 324,904

FORM 6 Summary of Total Annual Revenue Required

Agency: Los Osos - User Charges (O&M and General Benefits)

FORM 6

Number of Accounts	USER GROUPS	VARIABLE O. M. & R. COSTS	FIXED O. M. & R. COSTS	CAPITAL REPLACEMENT FUND	DEBT SERVICE COSTS	WTR CAPITAL RESERVE FUND	TOTAL ANNUAL REVENUE REQUIRED	AVG ANNUAL REVENUE REQUIRED	AVG MONTHLY REVENUE REQUIRED
4,289	Single Family Residential	$ 446,099	$ 1,416,592	$ 158,306	$ 2,564,837	$ 255,347	$ 4,841,181	$ 1,129	$ 94.06
809	Multi Family Residential	63,115	200,421	22,397	362,877	36,127	684,937	847	70.55
542	Mobile Homes	28,201	89,553	10,008	162,142	16,142	306,046	565	47.06
147	Low-Load Non Residential	16,950	53,826	6,015	97,456	9,702	183,950	1,251	104.28
5	Medium-Load Non Residential	633	2,462	204	3,663	425	7,386	1,477	123.10
17	High-Load Non Residential	8,008	32,385	2,521	46,417	5,545	94,877	5,581	465.08
749	Special Users (Septage)	1,994	9,759	549	11,645	1,615	25,562	34	2.84
6,558	SUBTOTALS	565,000.00	$ 1,805,000	200,000.00	$ 3,249,037	324,903.71	$ 6,143,941	$ 937	$ 78.07
	Special users								
	Special users II								
	Special users III								
	Special users IV								
	Infiltration/Inflow								
	Future flow								
6,558	TOTALS	565,000.00	$ 1,805,000	200,000.00	$ 3,249,037	324,903.71	$ 6,143,941	$ 937	$ 78.07

Exhibit E - Required Project Revenue Analysis:

Scenario 2 – No 2nd Assessment / USDA Grant II

COUNTY OF SAN LUIS OBISPO
LOS OSOS WASTEWATER PROJECT

REQUIRED ANNUAL WASTEWATER REVENUES

Funding Scenario 2 - No 2nd Assessment / USDA Grant

	Single Family Residential 4,289	Multi Family Residential 809	Mobile Homes 542	Low-Load Non Residential 147	Med-Load Non Residential 5	High-Load Non Residential 17	Special Users (Septage) 749	Aggregate 6,558
P R O J E C T R E V E N U E S								
Variable OM&R Costs	446,099	63,115	28,201	16,950	633	8,008	1,994	565,000
Fixed OM&R Costs	1,416,592	200,421	89,553	53,826	2,462	32,385	9,759	1,805,000
Capital Replacement Fund	158,306	22,397	10,008	6,015	204	2,521	549	200,000
Operational/Replacement Costs	2,020,997	285,933	127,762	76,792	3,299	42,915	12,302	2,570,000
SRF Loan Repayment	1,689,610	239,048	106,813	64,200	2,413	30,578	7,671	2,140,333
SRF Debt Reserve Fund	168,212	23,799	10,634	6,392	280	3,653	1,064	214,033
Debt Service Costs	1,857,822	262,847	117,446	70,592	2,693	34,231	8,735	2,354,366
Total Project Revenues	3,878,819	548,781	245,208	147,383	5,991	77,146	21,037	4,924,366
Annual Average per Account	*904.36*	*678.34*	*452.41*	*1,002.61*	*1,198.29*	*4,537.97*	*28.09*	*750.89*
Monthly Average per Amount	*75.36*	*56.53*	*37.70*	*83.55*	*99.86*	*378.16*	*2.34*	*62.57*

FORM 1 Summary of Users and Wastewater Characteristics

Agency: Los Osos - User Charges (O&M and General Benefits) FORM 1

Number of Accounts	USER GROUPS	DAILY ADWF Gal/Day	DAILY BOD ppm	DAILY SS ppm	DESIGN Volume MG/Yr	DESIGN BOD K*Lbs/Yr	DESIGN SS K*Lbs/Yr	ANNUAL Volume MG/Yr	ANNUAL BOD K*Lbs/Yr	ANNUAL SS K*Lbs/Yr
4,289	Single Family Residential	556,213	260	1	203.018	440.50	1.69	203.02	440.50	1.69
809	Multi Family Residential	78,694	260	1	28.723	62.32	0.24	28.72	62.32	0.24
542	Mobile Homes	35,162	260	1	12.834	27.85	0.11	12.83	27.85	0.11
147	Low-Load Non Residential	21,134	260	1	7.714	16.74	0.06	7.71	16.74	0.06
5	Medium-Load Non Residential	515	800	1	0.188	1.26	0.00	0.19	1.26	0.00
17	High-Load Non Residential	5,776	1,000	1	2.108	17.59	0.02	2.11	17.59	0.02
749	Special Users (Septage)	410	5,400	1	0.150	6.74	0.00	0.15	6.74	0.00
6,558	SUBTOTALS	697,904	270		254.735	573.00	2.13	254.73	573.00	2.13
	Special users									
	Special users II									
	Special users III									
	Special users IV									
	Infiltration/Inflow									
	Future flow	239,100						87.27	0.00	0.00
6,558	TOTALS	937,004	201	1	254.735	573.00	2.13	342.01	573.00	2.13

FORM 2 Annual O. M. & R. and Non-operating Costs

Agency: **Los Osos - User Charges (O&M and General Benefits)** FORM 2

Cost Category	Current Annual Costs	First Year Of Full Operation
1. TREATMENT FACILITIES:		
(a) Fixed O & M Costs (labor)		$400,000
(b) Variable O & M Costs (energy & hauling)		505,000
(c) Replacement Costs (maint, filters, solids)		625,000
(d) Subtotal Treatment	$0	$1,530,000
2. COLLECTION SYSTEM:		
(e) Fixed O & M Costs (labor)	$0	$170,000
(f) Variable O & M Costs (energy)	0	60,000
(g) Replacement Costs	0	200,000
(h) Subtotal Collection	$0	$430,000
3. MISCELLANEOUS:		
(i) Overhead/Indirect	$0	$300,000
(j) Operating Reserve	0	50,000
(k) Other (allowances, habitat mitigation)	0	60,000
(l) Subtotal Miscellaneous	$0	$410,000
4. TOTAL - Variable Costs	$0	$565,000
5. TOTAL - Fixed Costs	$0	$1,805,000
6. TOTAL O. M. & R. Costs:	$0	$2,370,000
7. CAPITAL REPLACEMENT FUND:		$200,000
8. DEBT SERVICE:		
(m) Collected with User Fees		$2,140,333
(n) Collected from Other Sources	0	
(o) Total debt service	$0	$2,140,333
9. WASTEWATER CAPITAL RESERVE FUND:		$214,033 *

* collected with User Fees

FORM 4 Unit Cost Determination

Agency: Los Osos - User Charges (O&M and General Benefits) FORM 4

COST RECOVERY	PARAMETER ALLOCATION PERCENTAGES	ANNUAL COST ALLOCATED TO EACH PARAMETER	TOTAL ANNUAL QUANTITIES EXC. INFILT/INFLOW AND FUTURE FLOW	UNIT COST FOR EACH PARAMETER
1. Variable O&M Costs				
(a) Flow	73.70%	$416,405	254.735	$1,634.66
(b) BOD	26.30%	148,595	573.001	$259.33
(c) SS	0.00%	0	2.126	$0.00
(d) I/I	0.00%	0		
(e) Other	0.00%	0		
	-	$565,000		
		-		
2. Fixed O & M Costs				
(f) Flow	56.90%	$1,027,045	254.735	$4,031.82
(g) BOD	43.10%	777,955	573.001	$1,357.68
(h) SS	0.00%	0	2.126	$0.00
(i) I/I	0.00%	0		
(j) Other	0.00%	0		
	-	$1,805,000		
		-		
3. Capital Replacement Fund				
(k) Flow	80.70%	$161,400	254.735	$633.60
(l) BOD	19.30%	38,600	573.001	$67.36
(m) SS	0.00%	0	2.126	$0.00
(n) I/I	0.00%	0		
(o) Other	0.00%	0		
	-	$200,000		
		-		
4. Wastewater Capital Reserve Fund				
(k) Flow	60.80%	$130,132	254.735	$510.85
(l) BOD	39.20%	83,901	573.001	$146.42
(m) SS	0.00%	0	2.126	$0.00
(n) I/I	0.00%	0		
(o) Other	0.00%	0		
	-	$214,033		
		-		
5. Wastewater Capital Reserve Fund				
(p) Flow	73.20%	$1,566,724	254.735	$6,150.41
(q) BOD	26.80%	573,609	573.001	$1,001.06
(r) SS	0.00%	0	2.126	$0.00
(s) I/I	0.00%	0		
(t) Other	0.00%	0		
	-	$2,140,333		
		-		

FORM 5v Summary of Variable Portion of O. M. & R. Costs.

Agency: Los Osos - User Charges (O&M and General Benefits) FORM 5v

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $1,634.66		BOD Unit Cost $/Klb = $259.33		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 331,865	440.50	$ 114,234	1.69	$ 0	$ 446,099
809	Multi Family Residential	28.72	46,953	62.32	16,162	0.24	0	63,115
542	Mobile Homes	12.83	20,980	27.85	7,222	0.11	0	28,201
147	Low-Load Non Residential	7.71	12,610	16.74	4,341	0.06	0	16,950
5	Medium-Load Non Residential	0.19	307	1.26	326	0.00	0	633
17	High-Load Non Residential	2.11	3,446	17.59	4,562	0.02	0	8,008
749	Special Users (Septage)	0.15	245	6.74	1,749	0.00	0	1,994
6,558	SUBTOTALS	254.73	$ 416,405	573.00	$ 148,595	2.13	$ 0	$ 565,000
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 416,405	573.00	$ 148,595	2.13	$ 0	$ 565,000

FORM 5F Summary of Fixed Portion of O. M. & R. Costs.

Agency: Los Osos - User Charges (O&M and General Benefits)

FORM 5f

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $4,031.82		BOD Unit Cost $/Klb = $1,357.68		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 818,530	440.50	$ 598,062	1.69	$ 0	$ 1,416,592
809	Multi Family Residential	28.72	115,807	62.32	84,615	0.24	0	200,421
542	Mobile Homes	12.83	51,745	27.85	37,808	0.11	0	89,553
147	Low-Load Non Residential	7.71	31,102	16.74	22,725	0.06	0	53,826
5	Medium-Load Non Residential	0.19	758	1.26	1,704	0.00	0	2,462
17	High-Load Non Residential	2.11	8,500	17.59	23,886	0.02	0	32,385
749	Special Users (Septage)	0.15	603	6.74	9,156	0.00	0	9,759
6,558	SUBTOTALS	254.73	$ 1,027,045	573.00	$ 777,955	2.13	$ 0	$ 1,805,000
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 1,027,045	573.00	$ 777,955	2.13	$ 0	$ 1,805,000

FORM 5c Summary of Capital Replacement Fund Costs.

Agency: Los Osos - User Charges (O&M and General Benefits) **FORM 5c**

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $633.60		BOD Unit Cost $/Klb = $67.36		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 128,632	440.50	$ 29,674	1.69	$ 0	$ 158,306
809	Multi Family Residential	28.72	18,199	62.32	4,198	0.24	0	22,397
542	Mobile Homes	12.83	8,132	27.85	1,876	0.11	0	10,008
147	Low-Load Non Residential	7.71	4,888	16.74	1,128	0.06	0	6,015
5	Medium-Load Non Residential	0.19	119	1.26	85	0.00	0	204
17	High-Load Non Residential	2.11	1,336	17.59	1,185	0.02	0	2,521
749	Special Users (Septage)	0.15	95	6.74	454	0.00	0	549
6,558	SUBTOTALS	254.73	$ 161,400	573.00	$ 38,600	2.13	$ 0	$ 200,000
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 161,400	573.00	$ 38,600	2.13	$ 0	$ 200,000

FORM 5d Summary of Debt Service Fund Costs.

Agency: Los Osos - User Charges (O&M and General Benefits)

FORM 5d

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $6,150.41		BOD Unit Cost $/Klb = $1,001.06		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 1,248,641	440.50	$ 440,969	1.69	$ 0	$ 1,689,610
809	Multi Family Residential	28.72	176,659	62.32	62,389	0.24	0	239,048
542	Mobile Homes	12.83	78,936	27.85	27,877	0.11	0	106,813
147	Low-Load Non Residential	7.71	47,445	16.74	16,755	0.06	0	64,200
5	Medium-Load Non Residential	0.19	1,156	1.26	1,257	0.00	0	2,413
17	High-Load Non Residential	2.11	12,966	17.59	17,612	0.02	0	30,578
749	Special Users (Septage)	0.15	920	6.74	6,751	0.00	0	7,671
6,558	SUBTOTALS	254.73	$ 1,566,724	573.00	$ 573,609	2.13	$ 0	$ 2,140,333
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 1,566,724	573.00	$ 573,609	2.13	$ 0	$ 2,140,333

FORM 5w Summary of Wastewater Capital Reserve Fund Fund Costs

Agency: Los Osos - User Charges (O&M and General Benefits) **FORM 5w**

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $510.85		BOD Unit Cost $/Klb = $146.42		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 103,712	440.50	$ 64,500	1.69	$ 0	$ 168,212
809	Multi Family Residential	28.72	14,673	62.32	9,126	0.24	0	23,799
542	Mobile Homes	12.83	6,556	27.85	4,078	0.11	0	10,634
147	Low-Load Non Residential	7.71	3,941	16.74	2,451	0.06	0	6,392
5	Medium-Load Non Residential	0.19	96	1.26	184	0.00	0	280
17	High-Load Non Residential	2.11	1,077	17.59	2,576	0.02	0	3,653
749	Special Users (Septage)	0.15	76	6.74	987	0.00	0	1,064
6,558	SUBTOTALS	254.73	$ 130,132	573.00	$ 83,901	2.13	$ 0	$ 214,033
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 130,132	573.00	$ 83,901	2.13	$ 0	$ 214,033

FORM 6 Summary of Total Annual Revenue Required

Agency: Los Osos - User Charges (O&M and General Benefits)

FORM 6

Number of Accounts	USER GROUPS	VARIABLE O. M. & R. COSTS	FIXED O. M. & R. COSTS	CAPITAL REPLACEMENT FUND	DEBT SERVICE COSTS	WTR CAPITAL RESERVE FUND	TOTAL ANNUAL REVENUE REQUIRED	AVG ANNUAL REVENUE REQUIRED	AVG MONTHLY REVENUE REQUIRED
4,289	Single Family Residential	$ 446,099	$ 1,416,592	$ 158,306	$ 1,689,610	$ 168,212	$ 3,878,819	$ 904	$ 75.36
809	Multi Family Residential	63,115	200,421	22,397	239,048	23,799	548,781	678	56.53
542	Mobile Homes	28,201	89,553	10,008	106,813	10,634	245,208	452	37.70
147	Low-Load Non Residential	16,950	53,826	6,015	64,200	6,392	147,383	1,003	83.55
5	Medium-Load Non Residential	633	2,462	204	2,413	280	5,991	1,198	99.86
17	High-Load Non Residential	8,008	32,385	2,521	30,578	3,653	77,146	4,538	378.16
749	Special Users (Septage)	1,994	9,759	549	7,671	1,064	21,037	28	2.34
6,558	SUBTOTALS	565,000.00	$ 1,805,000	200,000.00	$ 2,140,333	214,033.29	$ 4,924,366	$ 751	$ 62.57
	Special users								
	Special users II								
	Special users III								
	Special users IV								
	Infiltration/Inflow								
	Future flow								
6,558	TOTALS	565,000.00	$ 1,805,000	200,000.00	$ 2,140,333	214,033.29	$ 4,924,366	$ 751	$ 62.57

Exhibit E - Required Project Revenue Analysis:

Scenario 3 – 2nd Assessment / No USDA Grant III

COUNTY OF SAN LUIS OBISPO
LOS OSOS WASTEWATER PROJECT

REQUIRED ANNUAL WASTEWATER REVENUES

Funding Scenario 3 - 2nd Assessment / No USDA Grant

	Single Family Residential 4,289	Multi Family Residential 809	Mobile Homes 542	Low-Load Non Residential 147	Med-Load Non Residential 5	High-Load Non Residential 17	Special Users (Septage) 749	Aggregate 6,558
P R O J E C T R E V E N U E S								
Variable OM&R Costs	446,099	63,115	28,201	16,950	633	8,008	1,994	565,000
Fixed OM&R Costs	1,416,592	200,421	89,553	53,826	2,462	32,385	9,759	1,805,000
Capital Replacement Fund	158,306	22,397	10,008	6,015	204	2,521	549	200,000
Operational/Replacement Costs	2,020,997	285,933	127,762	76,792	3,299	42,915	12,302	2,570,000
SRF Loan Repayment	1,048,413	148,331	66,278	39,837	1,497	18,974	4,760	1,328,089
SRF Debt Reserve Fund	104,377	14,767	6,598	3,966	174	2,267	660	132,809
Debt Service Costs	1,152,789	163,098	72,876	43,803	1,671	21,240	5,420	1,460,898
Total Project Revenues	3,173,787	449,032	200,638	120,594	4,970	64,155	17,722	4,030,898
Annual Average per Account	*739.98*	*555.05*	*370.18*	*820.37*	*993.91*	*3,773.83*	*23.66*	*614.65*
Monthly Average per Amount	*61.67*	*46.25*	*30.85*	*68.36*	*82.83*	*314.49*	*1.97*	*51.22*

FORM 1 Summary of Users and Wastewater Characteristics

Agency: Los Osos - User Charges (O&M and General Benefits) FORM 1

Number of Accounts	USER GROUPS	DAILY ADWF Gal/Day	DAILY BOD ppm	DAILY SS ppm	DESIGN Volume MG/Yr	DESIGN BOD K*Lbs/Yr	DESIGN SS K*Lbs/Yr	ANNUAL Volume MG/Yr	ANNUAL BOD K*Lbs/Yr	ANNUAL SS K*Lbs/Yr
4,289	Single Family Residential	556,213	260	1	203.018	440.50	1.69	203.02	440.50	1.69
809	Multi Family Residential	78,694	260	1	28.723	62.32	0.24	28.72	62.32	0.24
542	Mobile Homes	35,162	260	1	12.834	27.85	0.11	12.83	27.85	0.11
147	Low-Load Non Residential	21,134	260	1	7.714	16.74	0.06	7.71	16.74	0.06
5	Medium-Load Non Residential	515	800	1	0.188	1.26	0.00	0.19	1.26	0.00
17	High-Load Non Residential	5,776	1,000	1	2.108	17.59	0.02	2.11	17.59	0.02
749	Special Users (Septage)	410	5,400	1	0.150	6.74	0.00	0.15	6.74	0.00
6,558	SUBTOTALS	697,904	270		254.735	573.00	2.13	254.73	573.00	2.13
	Special users									
	Special users II									
	Special users III									
	Special users IV									
	Infiltration/Inflow									
	Future flow	239,100						87.27	0.00	0.00
6,558	TOTALS	937,004	201	1	254.735	573.00	2.13	342.01	573.00	2.13

FORM 2 Annual O. M. & R. and Non-operating Costs

Agency: **Los Osos - User Charges (O&M and General Benefits)** FORM 2

Cost Category	Current Annual Costs	First Year Of Full Operation
1. TREATMENT FACILITIES:		
(a) Fixed O & M Costs (labor)		$400,000
(b) Variable O & M Costs (energy & hauling)		505,000
(c) Replacement Costs (maint, filters, solids)		625,000
(d) Subtotal Treatment	$0	$1,530,000
2. COLLECTION SYSTEM:		
(e) Fixed O & M Costs (labor)	$0	$170,000
(f) Variable O & M Costs (energy)	0	60,000
(g) Replacement Costs	0	200,000
(h) Subtotal Collection	$0	$430,000
3. MISCELLANEOUS:		
(i) Overhead/Indirect	$0	$300,000
(j) Operating Reserve	0	50,000
(k) Other (allowances, habitat mitigation)	0	60,000
(l) Subtotal Miscellaneous	$0	$410,000
4. TOTAL - Variable Costs	$0	$565,000
5. TOTAL - Fixed Costs	$0	$1,805,000
6. TOTAL O. M. & R. Costs:	$0	$2,370,000
7. CAPITAL REPLACEMENT FUND:		$200,000
8. DEBT SERVICE:		
(m) Collected with User Fees		$1,328,089
(n) Collected from Other Sources	0	
(o) Total debt service	$0	$1,328,089
9. WASTEWATER CAPITAL RESERVE FUND:		$132,809 *

* collected with User Fees

FORM $ Unit Cost Determination

Agency: Los Osos - User Charges (O&M and General Benefits) FORM 4

COST RECOVERY	PARAMETER ALLOCATION PERCENTAGES	ANNUAL COST ALLOCATED TO EACH PARAMETER	TOTAL ANNUAL QUANTITIES EXC. INFILT/INFLOW AND FUTURE FLOW	UNIT COST FOR EACH PARAMETER
1. Variable O&M Costs				
(a) Flow	73.70%	$416,405	254.735	$1,634.66
(b) BOD	26.30%	148,595	573.001	$259.33
(c) SS	0.00%	0	2.126	$0.00
(d) I/I	0.00%	0		
(e) Other	0.00%	0		
	-	$565,000		
		-		
2. Fixed O & M Costs				
(f) Flow	56.90%	$1,027,045	254.735	$4,031.82
(g) BOD	43.10%	777,955	573.001	$1,357.68
(h) SS	0.00%	0	2.126	$0.00
(i) I/I	0.00%	0		
(j) Other	0.00%	0		
	-	$1,805,000		
		-		
3. Capital Replacement Fund				
(k) Flow	80.70%	$161,400	254.735	$633.60
(l) BOD	19.30%	38,600	573.001	$67.36
(m) SS	0.00%	0	2.126	$0.00
(n) I/I	0.00%	0		
(o) Other	0.00%	0		
	-	$200,000		
		-		
4. Wastewater Capital Reserve Fund				
(k) Flow	60.80%	$80,748	254.735	$316.99
(l) BOD	39.20%	52,061	573.001	$90.86
(m) SS	0.00%	0	2.126	$0.00
(n) I/I	0.00%	0		
(o) Other	0.00%	0		
	-	$132,809		
		-		
5. Wastewater Capital Reserve Fund				
(p) Flow	73.20%	$972,161	254.735	$3,816.36
(q) BOD	26.80%	355,928	573.001	$621.16
(r) SS	0.00%	0	2.126	$0.00
(s) I/I	0.00%	0		
(t) Other	0.00%	0		
	-	$1,328,089		
		-		

FORM 5v Summary of Variable Portion of O. M. & R. Costs.

Agency: Los Osos - User Charges (O&M and General Benefits) **FORM 5v**

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $1,634.66		BOD Unit Cost $/Klb = $259.33		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 331,865	440.50	$ 114,234	1.69	$ 0	$ 446,099
809	Multi Family Residential	28.72	46,953	62.32	16,162	0.24	0	63,115
542	Mobile Homes	12.83	20,980	27.85	7,222	0.11	0	28,201
147	Low-Load Non Residential	7.71	12,610	16.74	4,341	0.06	0	16,950
5	Medium-Load Non Residential	0.19	307	1.26	326	0.00	0	633
17	High-Load Non Residential	2.11	3,446	17.59	4,562	0.02	0	8,008
749	Special Users (Septage)	0.15	245	6.74	1,749	0.00	0	1,994
6,558	SUBTOTALS	254.73	$ 416,405	573.00	$ 148,595	2.13	$ 0	$ 565,000
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 416,405	573.00	$ 148,595	2.13	$ 0	$ 565,000

FORM 5F Summary of Fixed Portion of O. M. & R. Costs.

Agency: Los Osos - User Charges (O&M and General Benefits) **FORM 5f**

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $4,031.82		BOD Unit Cost $/Klb = $1,357.68		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 818,530	440.50	$ 598,062	1.69	$ 0	$ 1,416,592
809	Multi Family Residential	28.72	115,807	62.32	84,615	0.24	0	200,421
542	Mobile Homes	12.83	51,745	27.85	37,808	0.11	0	89,553
147	Low-Load Non Residential	7.71	31,102	16.74	22,725	0.06	0	53,826
5	Medium-Load Non Residential	0.19	758	1.26	1,704	0.00	0	2,462
17	High-Load Non Residential	2.11	8,500	17.59	23,886	0.02	0	32,385
749	Special Users (Septage)	0.15	603	6.74	9,156	0.00	0	9,759
6,558	SUBTOTALS	254.73	$ 1,027,045	573.00	$ 777,955	2.13	$ 0	$ 1,805,000
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 1,027,045	573.00	$ 777,955	2.13	$ 0	$ 1,805,000

FORM 5c Summary of Capital Replacement Fund Costs.

Agency: Los Osos - User Charges (O&M and General Benefits) **FORM 5c**

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $633.60		BOD Unit Cost $/Klb = $67.36		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 128,632	440.50	$ 29,674	1.69	$ 0	$ 158,306
809	Multi Family Residential	28.72	18,199	62.32	4,198	0.24	0	22,397
542	Mobile Homes	12.83	8,132	27.85	1,876	0.11	0	10,008
147	Low-Load Non Residential	7.71	4,888	16.74	1,128	0.06	0	6,015
5	Medium-Load Non Residential	0.19	119	1.26	85	0.00	0	204
17	High-Load Non Residential	2.11	1,336	17.59	1,185	0.02	0	2,521
749	Special Users (Septage)	0.15	95	6.74	454	0.00	0	549
6,558	SUBTOTALS	254.73	$ 161,400	573.00	$ 38,600	2.13	$ 0	$ 200,000
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 161,400	573.00	$ 38,600	2.13	$ 0	$ 200,000

FORM 5d Summary of Debt Service Fund Costs.

Agency: Los Osos - User Charges (O&M and General Benefits)

FORM 5d

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $3,816.36		BOD Unit Cost $/Klb = $621.16		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 774,789	440.50	$ 273,624	1.69	$ 0	$ 1,048,413
809	Multi Family Residential	28.72	109,618	62.32	38,713	0.24	0	148,331
542	Mobile Homes	12.83	48,980	27.85	17,298	0.11	0	66,278
147	Low-Load Non Residential	7.71	29,440	16.74	10,397	0.06	0	39,837
5	Medium-Load Non Residential	0.19	718	1.26	780	0.00	0	1,497
17	High-Load Non Residential	2.11	8,045	17.59	10,928	0.02	0	18,974
749	Special Users (Septage)	0.15	571	6.74	4,189	0.00	0	4,760
6,558	SUBTOTALS	254.73	$ 972,161	573.00	$ 355,928	2.13	$ 0	$ 1,328,089
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 972,161	573.00	$ 355,928	2.13	$ 0	$ 1,328,089

FORM 5w Summary of Wastewater Capital Reserve Fund Fund Costs

Agency: Los Osos - User Charges (O&M and General Benefits) **FORM 5w**

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $316.99		BOD Unit Cost $/Klb = $90.86		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 64,354	440.50	$ 40,023	1.69	$ 0	$ 104,377
809	Multi Family Residential	28.72	9,105	62.32	5,662	0.24	0	14,767
542	Mobile Homes	12.83	4,068	27.85	2,530	0.11	0	6,598
147	Low-Load Non Residential	7.71	2,445	16.74	1,521	0.06	0	3,966
5	Medium-Load Non Residential	0.19	60	1.26	114	0.00	0	174
17	High-Load Non Residential	2.11	668	17.59	1,598	0.02	0	2,267
749	Special Users (Septage)	0.15	47	6.74	613	0.00	0	660
6,558	SUBTOTALS	254.73	$ 80,748	573.00	$ 52,061	2.13	$ 0	$ 132,809
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 80,748	573.00	$ 52,061	2.13	$ 0	$ 132,809

FORM 6 Summary of Total Annual Revenue Required

Agency: Los Osos - User Charges (O&M and General Benefits) **FORM 6**

Number of Accounts	USER GROUPS	VARIABLE O. M. & R. COSTS	FIXED O. M. & R. COSTS	CAPITAL REPLACEMENT FUND	DEBT SERVICE COSTS	WTR CAPITAL RESERVE FUND	TOTAL ANNUAL REVENUE REQUIRED	AVG ANNUAL REVENUE REQUIRED	AVG MONTHLY REVENUE REQUIRED
4,289	Single Family Residential	$ 446,099	$ 1,416,592	$ 158,306	$ 1,048,413	$ 104,377	$ 3,173,787	$ 740	$ 61.67
809	Multi Family Residential	63,115	200,421	22,397	148,331	14,767	449,032	555	46.25
542	Mobile Homes	28,201	89,553	10,008	66,278	6,598	200,638	370	30.85
147	Low-Load Non Residential	16,950	53,826	6,015	39,837	3,966	120,594	820	68.36
5	Medium-Load Non Residential	633	2,462	204	1,497	174	4,970	994	82.83
17	High-Load Non Residential	8,008	32,385	2,521	18,974	2,267	64,155	3,774	314.49
749	Special Users (Septage)	1,994	9,759	549	4,760	660	17,722	24	1.97
6,558	SUBTOTALS	565,000.00	$ 1,805,000	200,000.00	$ 1,328,089	132,808.90	$ 4,030,898	$ 615	$ 51.22
	Special users								
	Special users II								
	Special users III								
	Special users IV								
	Infiltration/Inflow								
	Future flow								
6,558	TOTALS	565,000.00	$ 1,805,000	200,000.00	$ 1,328,089	132,808.90	$ 4,030,898	$ 615	$ 51.22

Exhibit E - Required Project Revenue Analysis:

Scenario 4 – 2nd Assessment / USDA Grant IV

COUNTY OF SAN LUIS OBISPO
LOS OSOS WASTEWATER PROJECT

REQUIRED ANNUAL WASTEWATER REVENUES

Funding Scenario 4 - 2nd Assessment / USDA Grant

	Single Family Residential 4,289	Multi Family Residential 809	Mobile Homes 542	Low-Load Non Residential 147	Med-Load Non Residential 5	High-Load Non Residential 17	Special Users (Septage) 749	Aggregate 6,558
P R O J E C T R E V E N U E S								
Variable OM&R Costs	446,099	63,115	28,201	16,950	633	8,008	1,994	565,000
Fixed OM&R Costs	1,416,592	200,421	89,553	53,826	2,462	32,385	9,759	1,805,000
Capital Replacement Fund	158,306	22,397	10,008	6,015	204	2,521	549	200,000
Operational/Replacement Costs	2,020,997	285,933	127,762	76,792	3,299	42,915	12,302	2,570,000
SRF Loan Repayment	355,561	50,305	22,478	13,510	508	6,435	1,614	450,411
SRF Debt Reserve Fund	35,399	5,008	2,238	1,345	59	769	224	45,041
Debt Service Costs	390,960	55,314	24,715	14,855	567	7,203	1,838	495,452
Total Project Revenues	2,411,957	341,247	152,477	91,647	3,865	50,118	14,140	3,065,452
Annual Average per Account	*562.36*	*421.81*	*281.32*	*623.45*	*773.08*	*2,948.14*	*18.88*	*467.44*
Monthly Average per Amount	*46.86*	*35.15*	*23.44*	*51.95*	*64.42*	*245.68*	*1.57*	*38.95*

FORM 1 Summary of Users and Wastewater Characteristics

Agency: Los Osos - User Charges (O&M and General Benefits) FORM 1

Number of Accounts	USER GROUPS	DAILY ADWF Gal/Day	DAILY BOD ppm	DAILY SS ppm	DESIGN Volume MG/Yr	DESIGN BOD K*Lbs/Yr	DESIGN SS K*Lbs/Yr	ANNUAL Volume MG/Yr	ANNUAL BOD K*Lbs/Yr	ANNUAL SS K*Lbs/Yr
4,289	Single Family Residential	556,213	260	1	203.018	440.50	1.69	203.02	440.50	1.69
809	Multi Family Residential	78,694	260	1	28.723	62.32	0.24	28.72	62.32	0.24
542	Mobile Homes	35,162	260	1	12.834	27.85	0.11	12.83	27.85	0.11
147	Low-Load Non Residential	21,134	260	1	7.714	16.74	0.06	7.71	16.74	0.06
5	Medium-Load Non Residential	515	800	1	0.188	1.26	0.00	0.19	1.26	0.00
17	High-Load Non Residential	5,776	1,000	1	2.108	17.59	0.02	2.11	17.59	0.02
749	Special Users (Septage)	410	5,400	1	0.150	6.74	0.00	0.15	6.74	0.00
		Operational/Replacement Costs								
6,558	SUBTOTALS	697,904	270		254.735	573.00	2.13	254.73	573.00	2.13
	Special users									
	Special users II									
	Special users III									
	Special users IV									
	Infiltration/Inflow									
	Future flow	239,100						87.27	0.00	0.00
6,558	TOTALS	937,004	201	1	254.735	573.00	2.13	342.01	573.00	2.13

FORM 2 Annual O. M. & R. and Non-operating Costs

Agency: **Los Osos - User Charges (O&M and General Benefits)** FORM 2

Cost Category	Current Annual Costs	First Year Of Full Operation
1. TREATMENT FACILITIES:		
(a) Fixed O & M Costs (labor)		$400,000
(b) Variable O & M Costs (energy & hauling)		505,000
(c) Replacement Costs (maint, filters, solids)		625,000
(d) Subtotal Treatment	$0	$1,530,000
2. COLLECTION SYSTEM:		
(e) Fixed O & M Costs (labor)	$0	$170,000
(f) Variable O & M Costs (energy)	0	60,000
(g) Replacement Costs	0	200,000
Operational/Replacement Costs	$0	$430,000
3. MISCELLANEOUS:		
(i) Overhead/Indirect	$0	$300,000
(j) Operating Reserve	0	50,000
(k) Other (allowances, habitat mitigation)	0	60,000
(l) Subtotal Miscellaneous	$0	$410,000
4. TOTAL - Variable Costs	$0	$565,000
5. TOTAL - Fixed Costs	$0	$1,805,000
6. TOTAL O. M. & R. Costs:	$0	$2,370,000
7. CAPITAL REPLACEMENT FUND:		$200,000
8. DEBT SERVICE:		
(m) Collected with User Fees		$450,411
(n) Collected from Other Sources	0	
(o) Total debt service	$0	$450,411
9. WASTEWATER CAPITAL RESERVE FUND:		$45,041 *

* collected with User Fees

FORM 4 Unit Cost Determination

Agency: Los Osos - User Charges (O&M and General Benefits) FORM 4

COST RECOVERY	PARAMETER ALLOCATION PERCENTAGES	ANNUAL COST ALLOCATED TO EACH PARAMETER	TOTAL ANNUAL QUANTITIES EXC. INFILT/INFLOW AND FUTURE FLOW	UNIT COST FOR EACH PARAMETER
1. Variable O&M Costs				
(a) Flow	73.70%	$416,405	254.735	$1,634.66
(b) BOD	26.30%	148,595	573.001	$259.33
(c) SS	0.00%	0	2.126	$0.00
(d) I/I	0.00%	0		
(e) Other	0.00%	0		
	-	$565,000		
		-		
2. Fi Operational/Replacement Costs				
(f) Flow	56.90%	$1,027,045	254.735	$4,031.82
(g) BOD	43.10%	777,955	573.001	$1,357.68
(h) SS	0.00%	0	2.126	$0.00
(i) I/I	0.00%	0		
(j) Other	0.00%	0		
	-	$1,805,000		
		-		
3. Capital Replacement Fund				
(k) Flow	80.70%	$161,400	254.735	$633.60
(l) BOD	19.30%	38,600	573.001	$67.36
(m) SS	0.00%	0	2.126	$0.00
(n) I/I	0.00%	0		
(o) Other	0.00%	0		
	-	$200,000		
		-		
4. Wastewater Capital Reserve Fund				
(k) Flow	60.80%	$27,385	254.735	$107.50
(l) BOD	39.20%	17,656	573.001	$30.81
(m) SS	0.00%	0	2.126	$0.00
(n) I/I	0.00%	0		
(o) Other	0.00%	0		
	-	$45,041		
		-		
5. Wastewater Capital Reserve Fund				
(p) Flow	73.20%	$329,701	254.735	$1,294.29
(q) BOD	26.80%	120,710	573.001	$210.66
(r) SS	0.00%	0	2.126	$0.00
(s) I/I	0.00%	0		
(t) Other	0.00%	0		
	-	$450,411		
		-		

FORM 5v Summary of Variable Portion of O. M. & R. Costs.

Agency: Los Osos - User Charges (O&M and General Benefits)

FORM 5v

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $1,634.66		BOD Unit Cost $/Klb = $259.33		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 331,865	440.50	$ 114,234	1.69	$ 0	$ 446,099
809	Multi Family Residential	28.72	46,953	62.32	16,162	0.24	0	63,115
542	Mobile Homes	12.83	20,980	27.85	7,222	0.11	0	28,201
147	Low-Load Non Residential	7.71	12,610	16.74	4,341	0.06	0	16,950
5	Medium-Load Non Residential	0.19	307	1.26	326	0.00	0	633
17	High-Load Non Residential	2.11	3,446	17.59	4,562	0.02	0	8,008
749	Special Users (Septage)	0.15	245	6.74	1,749	0.00	0	1,994
		Operational/Replacement Costs						
6,558	SUBTOTALS	254.73	$ 416,405	573.00	$ 148,595	2.13	$ 0	$ 565,000
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 416,405	573.00	$ 148,595	2.13	$ 0	$ 565,000

FORM 5F Summary of Fixed Portion of O. M. & R. Costs.

Agency: Los Osos - User Charges (O&M and General Benefits) **FORM 5f**

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $4,031.82		BOD Unit Cost $/Klb = $1,357.68		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 818,530	440.50	$ 598,062	1.69	$ 0	$ 1,416,592
809	Multi Family Residential	28.72	115,807	62.32	84,615	0.24	0	200,421
542	Mobile Homes	12.83	51,745	27.85	37,808	0.11	0	89,553
147	Low-Load Non Residential	7.71	31,102	16.74	22,725	0.06	0	53,826
5	Medium-Load Non Residential	0.19	758	1.26	1,704	0.00	0	2,462
17	High-Load Non Residential	2.11	8,500	17.59	23,886	0.02	0	32,385
749	Special Users (Septage)	0.15	603	6.74	9,156	0.00	0	9,759
		Operational/Replacement Costs						
6,558	SUBTOTALS	254.73	$ 1,027,045	573.00	$ 777,955	2.13	$ 0	$ 1,805,000
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 1,027,045	573.00	$ 777,955	2.13	$ 0	$ 1,805,000

FORM 5c Summary of Capital Replacement Fund Costs.

Agency: Los Osos - User Charges (O&M and General Benefits) **FORM 5c**

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $633.60		BOD Unit Cost $/Klb = $67.36		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 128,632	440.50	$ 29,674	1.69	$ 0	$ 158,306
809	Multi Family Residential	28.72	18,199	62.32	4,198	0.24	0	22,397
542	Mobile Homes	12.83	8,132	27.85	1,876	0.11	0	10,008
147	Low-Load Non Residential	7.71	4,888	16.74	1,128	0.06	0	6,015
5	Medium-Load Non Residential	0.19	119	1.26	85	0.00	0	204
17	High-Load Non Residential	2.11	1,336	17.59	1,185	0.02	0	2,521
749	Special Users (Septage)	0.15	95	6.74	454	0.00	0	549
		Operational/Replacement Costs						
6,558	SUBTOTALS	254.73	$ 161,400	573.00	$ 38,600	2.13	$ 0	$ 200,000
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 161,400	573.00	$ 38,600	2.13	$ 0	$ 200,000

FORM 5d Summary of Debt Service Fund Costs.

Agency: Los Osos - User Charges (O&M and General Benefits) **FORM 5d**

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $1,294.29		BOD Unit Cost $/Klb = $210.66		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 262,764	440.50	$ 92,797	1.69	$ 0	$ 355,561
809	Multi Family Residential	28.72	37,176	62.32	13,129	0.24	0	50,305
542	Mobile Homes	12.83	16,611	27.85	5,866	0.11	0	22,478
147	Low-Load Non Residential	7.71	9,984	16.74	3,526	0.06	0	13,510
5	Medium-Load Non Residential	0.19	243	1.26	264	0.00	0	508
17	High-Load Non Residential	2.11	2,729	17.59	3,706	0.02	0	6,435
749	Special Users (Septage)	0.15	194	6.74	1,421	0.00	0	1,614
		Operational/Replacement Costs						
6,558	SUBTOTALS	254.73	$ 329,701	573.00	$ 120,710	2.13	$ 0	$ 450,411
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 329,701	573.00	$ 120,710	2.13	$ 0	$ 450,411

FORM 5w Summary of Wastewater Capital Reserve Fund Fund Costs

Agency: Los Osos - User Charges (O&M and General Benefits) **FORM 5w**

Number of Accounts	USER GROUPS	FLOW Unit Cost $/Mgal= $107.50		BOD Unit Cost $/Klb = $30.81		SS Unit Cost $/Klb = $0.00		TOTAL COST
		Flow, Mgal	Cost	BOD, Klb	Cost	SS, Klb	Cost	
4,289	Single Family Residential	203.02	$ 21,825	440.50	$ 13,573	1.69	$ 0	$ 35,399
809	Multi Family Residential	28.72	3,088	62.32	1,920	0.24	0	5,008
542	Mobile Homes	12.83	1,380	27.85	858	0.11	0	2,238
147	Low-Load Non Residential	7.71	829	16.74	516	0.06	0	1,345
5	Medium-Load Non Residential	0.19	20	1.26	39	0.00	0	59
17	High-Load Non Residential	2.11	227	17.59	542	0.02	0	769
749	Special Users (Septage)	0.15	16	6.74	208	0.00	0	224
		Operational/Replacement Costs						
6,558	SUBTOTALS	254.73	$ 27,385	573.00	$ 17,656	2.13	$ 0	$ 45,041
	Special users							
	Special users II							
	Special users III							
	Special users IV							
	Infiltration/Inflow							
	Future flow							
6,558	TOTALS	254.73	$ 27,385	573.00	$ 17,656	2.13	$ 0	$ 45,041

FORM 6 Summary of Total Annual Revenue Required

Agency: Los Osos - User Charges (O&M and General Benefits)

FORM 6

Number of Accounts	USER GROUPS	VARIABLE O. M. & R. COSTS	FIXED O. M. & R. COSTS	CAPITAL REPLACEMENT FUND	DEBT SERVICE COSTS	WTR CAPITAL RESERVE FUND	TOTAL ANNUAL REVENUE REQUIRED	AVG ANNUAL REVENUE REQUIRED	AVG MONTHLY REVENUE REQUIRED
4,289	Single Family Residential	$ 446,099	$ 1,416,592	$ 158,306	$ 355,561	$ 35,399	$ 2,411,957	$ 562	$ 46.86
809	Multi Family Residential	63,115	200,421	22,397	50,305	5,008	341,247	422	35.15
542	Mobile Homes	28,201	89,553	10,008	22,478	2,238	152,477	281	23.44
147	Low-Load Non Residential	16,950	53,826	6,015	13,510	1,345	91,647	623	51.95
5	Medium-Load Non Residential	633	2,462	204	508	59	3,865	773	64.42
17	High-Load Non Residential	8,008	32,385	2,521	6,435	769	50,118	2,948	245.68
749	Special Users (Septage)	1,994	9,759	549	1,614	224	14,140	19	1.57
		Operational/Replacement Costs							
6,558	SUBTOTALS	565,000.00	$ 1,805,000	200,000.00	$ 450,411	45,041.11	$ 3,065,452	$ 467	$ 38.95
	Special users								
	Special users II								
	Special users III								
	Special users IV								
	Infiltration/Inflow								
	Future flow								
6,558	TOTALS	565,000.00	$ 1,805,000	200,000.00	$ 450,411	45,041.11	$ 3,065,452	$ 467	$ 38.95

Exhibit 2H

Los Osos Wastewater Project

Revenue Requirements and Rate Analysis

October 2010

Public Financial Management, Inc.

719 Second Avenue, Suite 801
Seattle, WA 98104

(206) 264-8900 phone
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I. SUMMARY OVERVIEW

It is important to acknowledge that the rates determined in this study are not anticipated to be collected until after the Los Osos Wastewater System (the "Project") is estimated to be completed in 2014, and are based upon many key assumptions. The cost of completing the Project, the terms of the financings used to secure the construction of the Project, and the future operating and maintenance costs each directly impact the wastewater charges that will need to be imposed by the County of San Luis Obispo (the "County") to fund the wastewater system.

This study assumes that the aggregate rates will need to be established at a level sufficient to pay the ongoing operating, maintenance and capital replacement reserves ("OM&R") of the Project. This study also assumes that the aggregate rates charged will need to repay the portion of project financing not available to be repaid by assessments collected by the County. Finally, this report outlines the method describing the allocation of rates among categories of users in the manner best deemed equitable by the County in light of the estimated use of water for such categories.

II. REQUIRED WASTEWATER CHARGES

Establishing Overall Charges Necessary for OM&R

Estimated annual OM&R levels have been provided by the County, based upon conservative wastewater use levels of the Project. The estimated first year of full operation is anticipated to process approximately 254.6 megagallons of wastewater through the Collection System and cost $2.37 million, with approximately 76% constituting fixed costs and 24% representing variable costs. A breakdown of these estimated costs by category is as follows:

Table 1. - Estimated First Year of Full Operation

	Fixed Costs	Variable Costs
Treatment Facilities:		
labor	$400,000	
energy and hauling		$505,000
replacement costs (maint, filters, solids)	625,000	
Collection System:		
labor	170,000	
energy and hauling		60,000
replacement costs (maint, filters, solids)	200,000	
Miscellaneous		
overhead/indirect	300,000	
operating reserve	50,000	
other (allowances, habitat mitigation)	60,000	
	$1,805,000	$565,000

Establishing Overall Charges Necessary for Capital Costs

Future annual charges of the wastewater system necessary to repay the debt incurred to finance the Project's construction are dependent on the terms of the loans and associated bonds, and on the assessments levied on parcels. The County has received a Letter of Conditions for a loan and a grant from the United States Department of Agriculture and Rural Development (a "USDA Loan" and "USDA Grant") for $83.129 million and $4.061 million, respectively. The County has also been working with the State of California to secure advantageous financing from its State Revolving Fund Loan program (an "SRF Loan") for the remaining costs of constructing the Project. Each of the USDA Loan, USDA Grant and SRF Loan are subject to the Project meeting certain conditions. One such condition is the USDA requiring an additional annual deposit of $206,300 into a depreciation reserve for short-lived assets.

Pursuant to the December 2007 passage of the Proposition 218 Assessment Vote within the San Luis Obispo County Wastewater Assessment District No. 1, approximately $127 million of the wastewater system's development costs will be funded through assessments levied on developed properties (the "Assessments"). A condition of the USDA Loan is that it be repaid entirely from Assessments (the USDA Grant will not require repayment at all). The SRF Loan will be repaid by the remaining Assessments and by wastewater charges to the System's users.

The costs of the Project, including accrued interest and financing costs, are estimated by the County to be $167.11 million. An additional $6.5 million is being required by the State of California to repay an outstanding loan previously provided by the State to the Los Osos Community Service District, and brings the total financing necessary for the development of the wastewater system to $173.61 million. In summary, the funding for this amount is provided as follows:

Table 2. – Repayment Sources of the Project's Funding Components

	Total Funding	Repaid by Assessments	Repaid by Users
USDA Loan	$83,129,000	$83,129,000	$ --
USDA Grant	4,061,000	--	--
SRF Loan	86,420,000	43,593,296	42,826,704
	$173,610,000	$126,722,296	$42,826,704

Based on current parameters of the SRF Loan program, discussions with the State, and current market interest rates, the annual wastewater charges required to repay the approximate $42.8 million portion of the SRF Loan is approximately $2.88 million. This portion of the SRF Loan will also require an annual reserve fund deposit equal to 10% of the annual debt service payment for the first ten years of the loan's repayment period. The SRF Loan is currently anticipated to mature twenty years from the date of completion of the Project, while the USDA Loan matures no greater than 40 years from the date of its closing. The final SRF Loan payment may be paid by the debt service reserve fund that is collected over the first ten years of the repayment period. With an estimated three year construction period and the previously identified OM&R costs, the annual wastewater system charges will need to fund the following amounts after the Project's completion:

Table 3. Estimated Annual Wastewater Charges Required

OM&R	$2,370,000
Depreciation Fund	206,300
SRF Loan	2,877,734
SRF Loan Reserve	287,773
	$5,741,807

III. ALLOCATION OF WASTEWATER CHARGES

There are four categories of users that are anticipated to use the collection system and treatment facility. These users are broken down into the following:

Table 4. – Customer Categories

	# of Users	Annual Mega Gallons	System % Flow
Single Family Residences	4,289	203.018	79.7%
Multifamily Residential	809	28.723	11.3%
Mobile Homes	542	12.834	5.0%
Non Residential	169	10.010	4.0%
	5,809	254.585	100%

A special user category exists to include residences in the Los Osos area that will remain on septic tanks and not be connected to the wastewater system. This category is anticipated to pay $22,500 a year to the treatment facility to have its wastewater disposed of via sewer trucks. Due to this special user offset, the 5,809 users to be connected to the Los Osos Wastewater system will be required to generate revenues sufficient to fund $5,719,307 ($5,741,807 less the $22,500 special user offset). This annual revenue requirement has been allocated among the user categories by the estimated flows of each category. The allocation of the $5,719,307 from the categories is shown in the following table.

Table 5. – Required Wastewater Charges per Category

	Single Family Residential	Multi Family Residential	Mobile Homes	Non Residential	Aggregate Accounts
Users per Category	4,289	809	542	169	5,809
Annual Mega Gallons	203.018	28.723	12.834	10.010	254.585
PROJECT REVENUE REQUIREMENTS					
Variable OM&R Costs	$ 450,556	$ 63,745	$ 28,483	$ 22,216	$ 565,000
Fixed OM&R Costs	1,439,387	203,647	90,994	70,972	1,805,000
Capital Replacement Fund	164,513	23,275	10,400	8,112	206,300
Operational/Replacement Costs	$ 2,054,456	$ 290,667	$ 129,877	$ 101,299	$ 2,576,300
Loan Repayment	$ 2,294,833	$ 324,676	$ 145,073	$ 113,152	$ 2,877,734
Debt Reserve Fund	229,483	32,468	14,507	11,315	287,773
Debt Service Costs	$ 2,524,316	$ 357,144	$ 159,580	$ 124,467	$ 3,165,507
Total Annual Revenue Requirements	$ 4,578,773	$ 647,811	$ 289,457	$ 225,766	$ 5,741,807
Less: Special Users (Septage) *	(17,943)	(2,539)	(1,134)	(885)	(22,500)
* applied proportionately to the other category charges					
Adjusted Annual Revenue Requirements	$ 4,560,830	$ 645,273	$ 288,323	$ 224,881	$ 5,719,307

Flat Rate ("Minimum" Charge) Component Calculations

The County has determined to fix the portion of the debt service costs into a flat minimum charge per user for each particular category. The percentage of the Debt Service Costs to the Total Annual Revenue Requirements is 55.1% ($3,165,507 divided by $5,741,807). This flat rate will be applied to each category as follows:

Table 6. – Flat Rate Calculation

	Single Family Residential	Multi Family Residential	Mobile Homes	Non Residential	Total
Users per Category	4,289	809	542	169	5,809
Adjusted Annual Revenue Requirements	$ 4,560,830	$ 645,273	$ 288,323	$ 224,881	$ 5,719,307
Flat Rate Component - 55.1% (rounded)					
Annual Aggregate Flat Rate	$ 2,514,425	$ 355,744	$ 158,955	$ 123,979	
Annual Flat Rate per User	$ 586	$ 440	$ 293	$ 734	
Monthly Flat Rate	$ 48.85	$ 36.64	$ 24.44	$ 61.13	

Volume Charge Component Calculation

Because the Adjusted Annual Revenue Requirements are allocated among the user categories on an anticipated wastewater flow basis, the volume charge per user in each category will be the same. The following table summarizes these calculations.

Table 7. – Volume Charge Calculation

	Single Family Residential	Multi Family Residential	Mobile Homes	Non Residential	Total
Annual Mega Gallons	203.018	28.723	12.834	10.010	254.585
Adjusted Annual Revenue Requirements	$ 4,560,830	$ 645,273	$ 288,323	$ 224,881	$ 5,719,307
Volume Charge Component - 44.9% (rounded)					
Annual Volume Rate Collections	$ 2,046,406	$ 289,528	$ 129,368	$ 100,902	
Volume Rate per Mega Gallon	$ 10,080	$ 10,080	$ 10,080	$ 10,080	
Volume Cost per Unit (748 gallons)	$ 7.54	$ 7.54	$ 7.54	$ 7.54	

IV. UNDEVELOPED PROPERTIES

If an assessment vote passes or connection fees are established on undeveloped properties to provide for $27,721,704 in funding, the portion of the SRF Loan repaid by wastewater charges would be reduced and Table 2 would be changed to the following:

Table 8. – Adjusted Repayment Sources of the Project's Funding Components

	Total Funding	Repaid by Assessments	Repaid by User Charges
USDA Loan	$83,129,000	$83,129,000	$ --
USDA Grant	4,061,000	--	--
SRF Loan	86,420,000	71,315,000	15,105,000
	$173,610,000	$154,444,000	$15,105,000

Consequently, the estimated annual wastewater charges required would change from Table 3 to the following:

Table 9. Adjusted Estimated Annual Wastewater Charges Required

OM&R	$2,370,000
Depreciation Fund	206,300
SRF Loan	1,014,978
SRF Loan Reserve	101,498
	$3,692,776

Applying the wastewater users and categories of Table 4 would result in lower Adjusted Annual Revenue Requirements per category as follows:

Table 10. – Adjusted Required Wastewater Charges per Category

	Single Family Residential	Multi Family Residential	Mobile Homes	Non Residential	Aggregate Accounts
Users per Category	4,289	809	542	169	5,809
Annual Mega Gallons	203.018	28.723	12.834	10.010	254.585
PROJECT REVENUE REQUIREMENTS					
Variable OM&R Costs	$ 450,556	$ 63,745	$ 28,483	$ 22,216	$ 565,000
Fixed OM&R Costs	1,439,387	203,647	90,994	70,972	1,805,000
Capital Replacement Fund	164,513	23,275	10,400	8,112	206,300
Operational/Replacement Costs	$ 2,054,456	$ 290,667	$ 129,877	$ 101,299	$ 2,576,300
Loan Repayment	$ 809,389	$ 114,513	$ 51,167	$ 39,909	$ 1,014,978
Debt Reserve Fund	80,939	11,451	5,117	3,991	101,498
Debt Service Costs	$ 890,327	$ 125,965	$ 56,284	$ 43,899	$ 1,116,476
Total Annual Revenue Requirements	$ 2,944,784	$ 416,632	$ 186,161	$ 145,199	$ 3,692,776
Less: Special Users (Septage) *	(17,943)	(2,539)	(1,134)	(885)	(22,500)
* applied proportionately to the other category charges					
Adjusted Annual Revenue Requirements	$ 2,926,841	$ 414,094	$ 185,027	$ 144,314	$ 3,670,276

Due to the lower debt service repaid by wastewater charges, the minimum charge per category will be adjusted to 30.2% ($1,116,478 divided by $3,692,776). This adjusted flat rate would then be applied to each category as follows:

Table 11. – Adjusted Flat Rate Calculation

	Single Family Residential	Multi Family Residential	Mobile Homes	Non Residential	Total
Accounts per Category	4,289	809	542	169	5,809
Adjusted Annual Revenue Requirements	$ 2,926,841	$ 414,094	$ 185,027	$ 144,314	$ 3,670,276
Flat Rate Component - 30.2% (rounded)					
Annual Aggregate Flat Rate	$ 884,903	$ 125,197	$ 55,941	$ 43,632	
Annual Flat Rate per User	$ 206	$ 155	$ 103	$ 258	
Monthly Flat Rate	$ 17.19	$ 12.90	$ 8.60	$ 21.51	

Exhibit 2I

California Coastal Commission

COASTAL DEVELOPMENT PERMIT

CDP A-3-SLO-09-055/069 (Los Osos Wastewater Project)

Issue Date: September 7, 2010

Coastal development permit (CDP) number A-3-SLO-09-055/069 was approved by the California Coastal Commission on June 11, 2010. CDP A-3-SLO-09-055/069 provides for the construction and operation of a community sewer system, including a treatment plant, collection/disposal/reuse facilities, and all associated development and infrastructure (all as more specifically described in the Commission's CDP file). CDP A-3-SLO-09-055/069 is subject to certain terms and conditions, including the standard and special conditions beginning on page 2 of this CDP.

By my signature below, the CDP is issued on behalf of the California Coastal Commission:

9/7/2010

Dan Carl, Central Coastal District Manager for Peter M. Douglas, Executive Director

Acknowledgement

The undersigned Permittees acknowledge receipt of this coastal development permit and agree to abide by all terms and conditions thereof. The undersigned Permittees acknowledge that Government Code Section 818.4 (that states in pertinent part that "a public entity is not liable for injury caused by the issuance of any permit") applies to the issuance of this coastal development permit.

9/17/2010

Permittee: San Luis Obispo County Public Works Department Date

Please note that this coastal development permit is not valid unless and until a copy of it with the signed acknowledgement has been returned to the California Coastal Commission's Central Coast District Office (14 Cal. Admin. Code Section 13158(a)).

Standard Conditions

1. **Notice of Receipt and Acknowledgment.** The permit is not valid and development shall not commence until a copy of the permit, signed by the Permittee or authorized agent, acknowledging receipt of the permit and acceptance of the terms and conditions, is returned to the Commission office.

2. **Expiration.** The permit will expire on June 11, 2012 if development has not commenced by that date. Development shall be pursued in a diligent manner and completed in a reasonable period of time. Application for extension of the permit must be made prior to the expiration date.

3. **Interpretation.** Any questions of intent or interpretation of any condition will be resolved by the Executive Director or the Commission.

4. **Assignment.** The permit may be assigned to any qualified person, provided assignee files with the Commission an affidavit accepting all terms and conditions of the permit.

5. **Terms and Conditions Run with the Land.** These terms and conditions shall be perpetual, and it is the intention of the Commission and the Permittee to bind all future owners and possessors of the subject property to the terms and conditions.

Special Conditions

1. **Final Project Plans.** PRIOR TO CONSTRUCTION, the Permittee shall submit two copies of Final Project Plans to the Executive Director for review and approval. The Final Project Plans shall include and shall be substantially in conformance with the plans associated with the proposed project description (see Section B.3. of this report) except that they shall be revised and supplemented to comply with the following requirements:

   a. **Treatment Plant Site Approved Development Envelope.** All development (including but not limited to buildings, tanks, infrastructure, parking, walkways, fences, etc.) shall be located within the development envelope and in the general configuration shown on Exhibit 2 (*Exhibit 1-3, Treatment Plant Site Plan*; last dated revised on April 13, 2010, and dated received in the Commission's Central Coast District Office on April 19, 2010). Development shall be prohibited outside of the approved development envelope except for habitat restoration and enhancement related development (see special condition 3(b) below) and access road related development (see special condition 1(b) below). Development shall be arranged so that activity and direct light that may be visible from outside of the development envelope is limited to the maximum extent feasible, and so that any activity that is unavoidably visible is minimized in its intensity. All development shall be identified on the Final Project Plans.

   b. **Treatment Plant Site Access Road.** The access road shall be located along the existing unpaved access road alignment extending from Los Osos Valley Road to the approved development envelope along the eastern property line of the Los Osos Mortuary and Memorial Park site and the western property line of the Andre site in such a manner as to limit its width and overall length as much as possible. The access road shall include measures to effectively screen noise and activity associated with access road traffic and activity from adjacent properties so long as such screen does not itself degrade public views from along Los Osos Valley Road. If the Permittee conclusively demonstrates that the above access road location is infeasible, then the access road shall be located as shown on Exhibit 2 (*Exhibit 1-2 Overall Project Site Plan*, New Access Road, last dated revised on April 13, 2010, and dated received in the Commission's Central Coast District Office on April 19, 2010) subject to all the same siting and design criteria, and subject to the additional requirement that a mitigation plan for impacts to the agricultural use and development of the property located between the access road, Los Osos Valley Road, and the Los Osos Mortuary and Memorial Park site shall be submitted for Executive Director review and approval.

c. **Treatment Plant Site Design.** The design and appearance of all development shall reflect a rural agricultural theme (i.e., simple and utilitarian lines and materials, including use of board and bats, corrugated metal, muted earth tone colors, etc.). The plans shall clearly identify all measures that will be applied to ensure such design aesthetic is achieved, including with respect to all structures and all other project elements within view of Los Osos Valley Road (including the access road itself, all drainage facilities, curbs, landscaping, screens, signs, etc.). Development shall be sited and designed so as to reduce its visibility from Los Osos Valley Road to the maximum extent feasible. At a minimum, the plans shall clearly identify all structural elements, materials, and finishes (including through site plans and elevations, materials palettes and representative photos, product brochures, etc.).

d. **Pump Station and Related Development.**

1. **Pump Station Design**. All pump stations and all related development, including all power boxes and buildings, shall be sited and designed to limit impacts on habitat areas and public views, including through limiting their footprint and proximity to habitat areas as much as possible, siting elements below ground where feasible, minimizing the scale of above ground elements as much as possible, limiting above-ground access components (including manhole/hatch entries) as much as possible, using surface treatment and structural design consistent with and compatible with the immediately surrounding environment, limiting lighting to that necessary for public safety, and removing non-native invasive plant species on each site and landscaping with appropriate native plant materials (see also special condition 3(d)) including so that landscaping can help soften the appearance of any elements that are unavoidably above ground and to ensure seamless connectivity to surrounding habitat and vegetation as much as possible.

2. **Midtown Pump Station.** The Midtown pump station shall be sited and designed to limit its footprint and depth (from the road). The Midtown pump station power building shall be relocated across Palisades Avenue to an already disturbed area of Los Osos Community Park in a location where it will have the least impact on Park use and aesthetics.

3. **Lupine Street Pump Station.** The Lupine Street pump station and standby power building shall be set back a minimum of 75 feet from the edge of wetlands located to the south and west of the pump station site.

e. **Lupine Street Force Main.** The force main that conveys sewage from the Lupine Street Pump Station towards the treatment plant shall be routed from the Lupine Street Pump Station east on Lupine Street, then south on Fearn Avenue, then east on Binscarth Road, and then south on Pine Avenue, terminating at Los Osos Valley Road.

f. **Recycled Water Re-use Infrastructure.** All recycled water reuse pipelines and related development shall be clearly identified, including all such development noted on the overall project site plan submitted to the Commission (titled *Exhibit 1-2, Overall Project Site Plan*, last dated revised April 13, 2010; dated received in the Commission's Central Coast District Office April 19, 2010) and also including connecting segments to each of the receiver sites identified there.

g. **Lighting.** All interior lighting shall be located so as to minimize the potential for light and glare to be visible from within adjacent habitat areas, including adjacent restoration and enhancement areas. All exterior lighting shall be shielded and be of the lowest intensity feasible in order to avoid artificial light pollution from project facilities into adjacent areas and the night sky. All exterior lighting elements adjacent to habitat areas, including adjacent to restoration and enhancement areas, shall be avoided where possible and where unavoidable for safety purposes shall be the minimum necessary to meet safety requirements, shall be shielded, and shall be directed downward and away from such habitat areas.

h. **Landscaping.** Final Plans shall include landscape and irrigation parameters that shall identify all plant materials (size, species, quantity), all irrigation systems, and all proposed maintenance for landscaping at both the treatment plant site (including along the access road) and at all pump station locations. All plant materials shall be native and non-invasive species selected to be complimentary with the mix of native habitats in the project vicinity, prevent the spread of exotic invasive plant species, and avoid contamination of the local native plant community gene pool. The landscape and irrigation plans shall be designed to protect and enhance native plant communities on and adjacent to the development locations, including required restoration and enhancement areas, and to provide a transitional buffer between native habitat areas and authorized development. Landscaping (at maturity) shall also be capable of partial/mottled screening and softening the appearance of new development as seen from public viewing areas as much as possible. All landscaped areas shall be continuously maintained by the Permittee in a litter-free, weed-free, and healthy growing condition. No plant species listed as problematic and/or invasive by the California Native Plant Society, the California Invasive Plant Council, or as may be so identified from time to time by the State of California, and no plant species listed as a 'noxious weed' by the State of California or the U.S. Federal Government shall be planted or allowed to naturalize or persist at the treatment plant site (including along the access road) and at all pump station locations.

i. **Sign Plan.** All signs associated with the approved project and identifying any component of it as seen from public viewing areas shall be identified and details showing the location, materials, design, and text of all signs shall be provided. The signs shall be sited and designed so as to provide clear information without adversely impacting public views and/or the character of the area in which the sign is located. At least three public education/interpretation signs and/or displays related to the project shall be installed at appropriate locations (e.g., at the Broderson site, at the Midtown site, and at the Giacomazzi site) easily accessible by the public, including in relation to the treatment plant site and at individual pump stations with significant above ground features.

j. **Street Reconstruction.** The Plans shall require that all public roadway work, including and up to complete roadway reconstruction, following installation/construction of approved project elements that impact public roadways shall be conducted in a manner that incorporates low impact development (LID) techniques and water quality protection systems to the maximum amount feasible.

k. **Walker Site.** The 6-acre Walker site (see Exhibit 2), although restoration of this area is not required until after it is no longer being used as the primary construction staging site for the approved project, shall be to be returned to its pre-project condition, or better (from a habitat perspective).

l. **Construction.** All construction staging and related areas shall be identified, and all development associated with such areas shown on a site plan. All such areas within which construction staging are to take place shall be minimized to the maximum extent feasible in order to minimize impacts on resources (e.g., terrestrial habitat, wetlands, creeks, riparian areas, or other sensitive resource areas, etc.). All measures to be taken to minimize impacts associated with construction staging and related areas shall be identified, including but not limited to screening, fencing, landscaping, signage, and designation of various activity and storage areas on the site. If additional construction staging and related areas are needed following approval of Final Plans, such areas shall be identified in a plan and submitted for Executive Director review and approval. The Final Plans shall require that copies of the signed CDP be maintained in a conspicuous location at the construction staging area at all times, and that such copies be available for public review on request. All persons involved with the construction shall be briefed on the content and meaning of the CDP, and the public review requirements applicable to them, prior to commencement of construction. The Final Plans shall also require that a primary construction coordinator be designated for public inquiries regarding the construction, and that their contact information (i.e., address, phone numbers, etc.) including, at a minimum, a telephone number available 24 hours a day for the duration of construction, be conspicuously posted at the construction staging area and at individual construction sites where such contact information is readily visible from public viewing areas, along with indication that the construction coordinator should be contacted in the case of questions regarding the construction (in case of both regular inquiries and emergencies). The construction coordinator shall record the name, phone number, and nature of all complaints received regarding the construction, and shall investigate complaints and take remedial action, if necessary, within 24 hours of receipt of the complaint or inquiry.

The Permittee shall undertake development in accordance with the approved Final Project Plans.

2. **Septic System Decommissioning Plan.** PRIOR TO ANY CONNECTION TO THE APPROVED WASTEWATER PROJECT, the Permittee shall submit two copies of a Septic System

Decommissioning Plan to the Executive Director for review and approval. The Septic System Decommissioning Plan shall clearly identify all measures to be taken to appropriately decommission existing septic tank systems and to connect such users to the approved project. The Plan shall provide a process for evaluating septic systems for possible on-site reuse, including for on-site filtration and percolation of stormwater to the degree feasible and appropriate, and a process for implementing such conversion or for implementing appropriate abandonment measures depending on which measure property owners choose. The Permittee shall undertake development in accordance with the approved Septic System Decommissioning Plan.

3. **Habitat Management Plan.** PRIOR TO CONSTRUCTION, the Permittee shall submit two copies of a Habitat Management Plan to the Executive Director for review and approval. The Habitat Management Plan shall provide for restoration and enhancement of the following areas to self-sustaining natural habitat states, and for management and protection of such areas as habitat areas in perpetuity:

   a. **Broderson Site.** The 80-acre Broderson site, of which up to 8 acres is allowed to be used for the project leach field provided this area too is subject to Plan requirements designed to ensure habitat value in this 8-acre area as much as possible while recognizing the underlying leach field infrastructure and its ongoing use and maintenance requirements.

   b. **Giacomazzi Site.** The 8.3 acres of the Giacomazzi site that is located outside of the approved development envelope and that includes identified wetland and related resources and their buffer (see Exhibit 8).

   c. **Midtown Site.** The 12.24-acre Midtown site (see Exhibit 2), of which a small area (approximately 0.10 acres, subject to special condition 1 requirements) is allowed to be used for the Midtown pump station and related development, provided this area, too, is subject to Plan requirements designed to ensure habitat value at the pump station location as much as possible while recognizing the underlying pump station infrastructure and its ongoing use and maintenance requirements.

   d. **Pump Station Sites.** The roughly 0.1-acre Sunny Oaks site, the 0.4-acre Solano site, and the 0.3-acre East Ysabel site (see Exhibit 2), a total of almost one acre, of which a small area at each site (approximately 0.32 total acres, subject to special condition 1 requirements) is allowed to be used for pump station and related development, provided these areas, too, are subject to Plan requirements designed to ensure habitat value at the pump station locations as much as possible while recognizing the underlying pump station infrastructure and its ongoing use and maintenance requirements.

The Habitat Management Plan shall require and provide for the Broderson site to be acquired prior to construction and granted by June 10, 2012 to an appropriate agency or conservation organization approved by the Executive Director, where such grant shall include funding adequate to implement the Habitat Management Plan over time. The Habitat Management Plan shall require and provide for the use of the Broderson, Giacommazi, Midtown, and Pump Station sites each to be restricted through recordation of a deed restriction, prohibiting all non resource-dependent development on each site, other than that associated with the approved project and consistent with the approved

Habitat Management Plan. The required deed restriction shall be in a form and content acceptable to the Executive Director and recorded free of prior liens and any other encumbrances that the Executive Director determines may affect the enforcement of the deed restriction.

The Habitat Management Plan shall be prepared by qualified restoration ecologists, shall be submitted with evidence of USFWS and CDFG review (or evidence that no review is required), and shall take into account the specific condition of each restoration and enhancement site (including soil, exposure, water flows, temperature, moisture, wind, etc.), as well as restoration and enhancement goals and success criteria. The Habitat Management Plan shall explicitly allow for potential public access interpretive facilities (including trails, signs/displays, etc.) even if such facilities are not part of initial Habitat Management Plan implementation activities, but rather will be a part of subsequent Plan implementation. At a minimum, the Plan shall provide for the following:

a. **Baseline.** A baseline assessment, including photographs, of the current physical and ecological condition of the restoration and enhancement areas. All existing topography, habitat types, and vegetation shall be depicted on a map.

b. **Goals.** A description of the goals of the plan, including in terms of topography, hydrology, vegetation, sensitive species, wildlife usage, and potential public interpretive access.

c. **Planting and Invasive/Non-Native Plant Provisions.** Except that the mature eucalyptus trees, and the mature cypress trees on the Broderson site shall remain and be managed as part of the Plan, all invasive and/or non-native plant species shall be removed from all restoration and enhancement areas, and native species of local stock appropriate to the habitats and the Los Osos area shall be planted,. A planting plan including the planting palette (seed mix and container plants), planting design, source of plant material, plant installation, erosion control, irrigation, and remediation shall be included. The planting palette shall be made up exclusively of native taxa that are appropriate to the habitats and the Los Osos region. Seed and/or vegetative propagules shall be obtained from local natural habitats so as to protect the genetic makeup of natural populations. Horticultural varieties shall not be used. Non-native and/or invasive plant species shall be prohibited. No plant species listed as problematic and/or invasive by the California Native Plant Society, the California Invasive Plant Council, or as may be so identified from time to time by the State of California, and no plant species listed as a 'noxious weed' by the State of California or the U.S. Federal Government shall be planted or allowed to naturalize or persist in the restoration and enhancement areas.

d. **Hydrology.** Ensuring that existing hydrological inputs, if applicable (e.g. for wetland areas at the Giacomazzi site), are maintained and if possible improved in favor of enhanced habitat value. To the extent there may be hydrological issues related to the habitat that is being restored and monitored overtime, these issues shall be considered and dealt with appropriately.

e. **Success Criteria**. A description of the measurable success criteria of the plan, including, at a minimum, the requirement that success be determined after a period of at least three years in which the sites have been subject to no remediation or maintenance activities other than weeding, and that this condition be maintained in perpetuity. Success criteria shall be defined for each habitat type, including in terms of species diversity, percent cover, invasive control, wildlife usage, and hydrology, and for potential public interpretive access. Interim and long-term success criteria shall be identified, with final success criteria required to be maintained in perpetuity.

f. **Monitoring.** Monitoring and maintenance provisions including a schedule of the proposed monitoring and maintenance activities to ensure that interim and long-term success criteria are achieved, and including a plan for documenting and reporting the physical and biological "as built" condition of the restoration and enhancement areas within 30 days of completion of the initial Habitat Management Plan implementation activities (i.e., a simple report to describe field implementation of the approved plan in narrative and photographs, and to report any implementation problems and their resolution). Monitoring shall be appropriate to habitat type, and shall at a minimum include identification of field sampling protocols (including specific field sampling techniques to be employed), study sites (including experimental/revegetation sites and reference sites), data analysis methods (including descriptive and inferential statistics with specified acceptable variance and significance levels to examine sample size, univariate and multivariate comparisons, and/or other parameters as appropriate and necessary to assess progress toward and meeting of success criteria), and assessment of progress toward meeting identified success criteria.

g. **Reporting.** Provision for submission of annual monitoring reports (two copies each time) to the Executive Director for review and approval beginning the first year after completion of initial Habitat Management Plan implementation activities and shifting to an every five-year reporting cycle once long-term success criteria have been achieved. Each report shall document the condition of each restoration and enhancement area based on monitoring data (including with photographs taken from the same fixed points in the same directions), shall describe the progress towards reaching and/or maintaining the success criteria of the plan, and shall make recommendations, if any, on changes necessary to achieve success. Necessary changes, including identified remediation steps, shall be completed per the timetable identified in any approved report, or within 30 days of report approval where no such timetable is specified.

The Habitat Management Plan shall be implemented concurrent with construction of the approved project, shall be directed by qualified restoration ecologists, and initial Habitat Management Plan implementation activities (including at a minimum initial planting and non-native/invasive plant removal pursuant to the Plan) shall be completed prior to commencement of operation of the approved project.

The Permittee shall undertake development in accordance with the approved Habitat Management Plan.

4. **Agricultural Property Protection.** PRIOR TO CONSTRUCTION OF THE TREATMENT PLANT, the Permittee shall submit evidence to the Executive Director for review and approval indicating that an agricultural conservation easement(s) burdening off-site agricultural property have been granted in perpetuity to the County or another qualifying entity approved by the Executive Director along with adequate funding to compensate for reasonable administrative costs incurred by the easement holder. The easement shall provide agricultural conservation acreage at a ratio of at least 2:1 for the loss of agricultural land associated with the approved project, shall apply to

agricultural land within reasonable proximity of the project site that is of a quality that is reasonably similar to that of the agricultural land lost, and shall be submitted with evidence clearly showing and calculating the amount of agricultural land lost due to the project in closed polygons on site plans and all supporting documentation demonstrating compliance with the requirements of this condition.

5. **Los Osos Basin Recycled Water Management Plan.** PRIOR TO CONSTRUCTION, the Permittee shall submit two copies of a Los Osos Basin Recycled Water Management Plan (Basin Plan) to the Executive Director for review and approval. The objective of the Basin Plan shall be to ensure that implementation of the project, including the sites designated for disposal of the treated effluent, is accomplished in a manner designed to maximize long-term ground and surface water and related resource (including wetlands, streams, creeks, lakes, riparian corridors, marshes, etc.) health and sustainability, including with respect to offsetting seawater intrusion as much as possible, within the Los Osos Groundwater Basin. The Basin Plan shall be structured so as to allow its programs to be developed, and any physical development underlying the implementation of such programs constructed, concurrent with construction of the approved project, and for it to be implemented concurrent with commencement of operation of the approved project. The Basin Plan may be structured to allow phasing if necessary to better achieve Basin Plan objectives. The Basin Plan shall include the following main components:

   a. **Recycled Water Reuse Program.** As reflected in County condition 97, the Recycled Water Reuse Program shall ensure that all tertiary treated recycled water is disposed of in locations within the Los Osos Groundwater Basin that will maximize its ability to meet Basin Plan objectives, where the highest priority for reuse shall be replacing existing potable water use with recycled water use where feasible and appropriate, including with respect to both urban and agricultural reuse. The Reuse Program may include recycled water application at the Broderson leach field (not to exceed 448 afy on an average annual basis) and at the Bayridge leach field (approximately 33 afy or the amount shown to be necessary for maintaining Willow Creek and downstream resources in their pre-project state or better), but it shall prioritize beneficial reuse through (a) developing and installing recycled water connections and entering into delivery/use agreements with urban and agricultural property owners as much as possible, and (b) developing and installing other recycled water delivery systems, in both cases with a priority for locations where such beneficial reuse will go the furthest toward meeting Basin Plan goals. The Reuse Program may include other areas that may be beneficial to the Los Osos Groundwater Basin.

   b. **Water Conservation Program.** The Water Conservation Program required by the County project, which limits indoor water use to no more than 50 gallons per person per day on average within the Basin, shall be incorporated into the Recycled Water Management Plan. The Program shall be designed to help Basin residents to reduce their potable water use as much as possible through measures including but not limited to retrofit and installation of low water use fixtures, and grey water systems. The Program shall include enforceable mechanisms designed to achieve its identified goals, including the 50 gallons per person per day target, and shall include provisions for use of the $5 million committed by the Permittee to initiate water conservation measures pursuant to the Basin Plan as soon as possible following CDP approval. The Permitee shall coordinate with water purveyors to the maximum extent feasible to integrate this conservation program with purveyor implemented outdoor water use reduction measures.

c. **Monitoring Program.** The Monitoring Program shall be designed to quantitatively and qualitatively assess the effectiveness of the Basin Plan over time to ensure its objectives are achieved, and shall include: a baseline physical and ecological assessment of ground and surface water and related resources to be monitored; measurable goals and interim and long-term success criteria for those resources, including at a minimum clear criteria that demonstrate that the health and sustainability of Plan area resources are steadily improving over time, including with respect to seawater intrusion; monitoring provisions, including identification of appropriate representative resource monitoring locations and data types (e.g., groundwater levels and quality; wetland, stream, creek, riparian, and marsh plant and animal abundance, hydrology, and water quality; etc.) and a schedule for proposed monitoring activities. The Monitoring Program shall also include measures to clearly document the manner in which recycled water is being reused and water is being conserved pursuant to the Recycled Water Reuse and Water Conservation Programs.

d. **Reporting and Adaptive Management Program.** Annual reports (two copies) documenting implementation and effectiveness of the Basin Plan shall be submitted to the Executive Director for review and approval by December 31st of each year that the project operates. Each report shall include all monitoring data (including documenting all recycled water reuse for the preceding year, all water conservation efforts and effects, and all resource changes identified), shall describe the progress towards achieving the success criteria of the plan, and shall make recommendations, if any, on changes necessary to better meet Basin Plan objectives and achieve success. On the latter, the annual reports shall be premised upon the concept of adaptive management that responds to information developed and effects better understood over time in association with the project, and is intended to allow for project changes covered by this CDP, unless the Executive Director determines that a CDP amendment is necessary, through the annual report approval process provided that such changes result in better resource protection and better means to achieve Basin Plan objectives over the long-term. Changes, including identified remediation steps, shall be completed per the timetable identified in any approved annual report, or within 30 days of report approval where no such timetable is specified.

The Permittee shall undertake development in accordance with the approved Los Osos Basin Water Recycling Management Plan.

6. **Wastewater Service to Undeveloped Properties.** Wastewater service to undeveloped properties within the service area shall be prohibited unless and until the Estero Area Plan is amended to identify appropriate and sustainable buildout limits, and any appropriate mechanisms to stay within such limits, based on conclusive evidence indicating that adequate water is available to support development of such properties without adverse impacts to ground and surface waters, including wetlands and all related habitats.

7. **Amendment.** All future changes to the approved project, including changes in service area, shall be processed as amendments to this CDP. Any such amendment shall clearly demonstrate the manner in which the amendment would lead to better coastal resource protection, including at a minimum the manner in which it would help to better achieve the goals and meet the success criteria of the approved Los Osos Basin Resource Management Plan (see special condition 5).

8. **Conflict Resolution.** Any differences, conflicts, and/or questions of interpretation between elements of the proposed project description and these conditions shall be resolved in favor of these conditions and in the manner most protective of coastal resources as determined by the Executive Director.

9. **Liability for Costs and Attorneys Fees.** The Permittee shall reimburse the Coastal Commission in full for all Coastal Commission costs and attorneys fees (including but not limited to such costs/fees that are: (1) charged by the Office of the Attorney General; and (2) required by a court) that the Coastal Commission incurs in connection with the defense of any action brought by a party other than the Permittee against the Coastal Commission, its officers, employees, agents, successors and assigns challenging the approval or issuance of this permit, the interpretation and/or enforcement of permit conditions, or any other matter related to this permit. The Permittee shall reimburse the Coastal Commission within 60 days of being informed by the Executive Director of the amount of such costs/fees. The Coastal Commission retains complete authority to conduct and direct the defense of any such action against the Coastal Commission.

Exhibit 2J

San Luis Obispo County
Los Osos Wastewater Project Development

TECHNICAL MEMORANDUM

PROJECTS ALTERNATIVES
GREENHOUSE GAS EMISSIONS INVENTORY

FINAL DRAFT
June 2008

2700 YGNACIO VALLEY ROAD • SUITE 300 • WALNUT CREEK, CALIFORNIA 94598 • (925) 932-1710 • FAX (925) 930-0208

San Luis Obispo County
Los Osos Wastewater Project Development

TECHNICAL MEMORANDUM

PROJECTS ALTERNATIVES GREENHOUSE GAS EMISSIONS INVENTORY

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PROJECTS ALTERNATIVES GREENHOUSE GAS EMISSIONS INVENTORY

1.0 PURPOSE

The purpose of this technical memorandum (TM) is to evaluate greenhouse gas (GHG) emissions for the proposed Los Osos wastewater treatment facility as discussed in the Viable Project Alternatives Fine Screening Analysis (Carollo, August 2007) and subsequent technical memoranda. The County of San Luis Obispo (County) seeks to estimate the annual greenhouse gas (GHG) emissions of two collection system alternatives, 1) Gravity Collection System and 2) STEP Collection System; and three treatment alternatives, 1) Oxidation Ditch Treatment, 2) BIOLAC Treatment, and 3) Air Diffusion System (ADS) Pond Treatment. This TM provides a comprehensive GHG inventory including both annual O&M and construction emissions that will aid in comparing alternatives.

The information in this TM will be used as 1) a basis for evaluating the impacts of project alternatives for the environmental review document, and 2) a basis for further developing the project alternatives.

2.0 BACKGROUND

The state of California adopted the Global Warming Solutions Act of 2006 (also known as Assembly Bill 32, AB 32) in September of 2006. This Act is the first regulatory program in the U.S. that will require public and private agencies statewide to reduce GHG emissions to 1990 levels by 2020. Currently, there is no mandate on publicly owned treatment works (POTWs); however, the California Air Resources Board (ARB) has stated that POTWs would be included in the near future and early voluntary reporting is recommended.

Pursuant to AB 32, this TM uses the California Climate Action Registry General Reporting Protocol (CCAR GRP), a set of measuring standards and protocols aligned with the international GHG Protocol Initiative and adapted to California. Assembly Bill 32 recommends using this protocol “where appropriate and to the maximum extent feasible.” Agencies that choose to participate in the CCAR process will not be required to significantly alter their reporting or verification program except as determined by ARB for compliance purposes.

Not all GHGs identified in AB 32 will be regulated for POTWs. This TM focuses on carbon dioxide, methane, and nitrous oxide GHG emissions as these gases are relevant to and comprise the majority of GHG emissions generated from the conveyance and treatment of wastewater. The estimated annual GHG emissions are a result of the construction and operations phases of the proposed alternatives. In general, annual GHG emissions generated are a function of the flow treated, the influent water quality, and the treatment processes used. A description of the calculation methodology is provided in the following section.

3.0 METHODOLOGY

The development of GHG emissions estimates requires a set of “boundary” conditions to define the life cycle stages, the unit processes, and the time frame that is included in the analysis. For this inventory, the construction and operations phases of the collection system and treatment facilities are considered. This includes:

- Construction of the collection system and treatment facilities (includes operation of construction equipment),
- Operation of the collection system and treatment facilities,
- Production and hauling of materials consumed and excavated for the construction of the collection system and treatment facilities,
- Production and hauling of chemicals consumed for the treatment of wastewater and biosolids annual operations,
- Hauling of septage from STEP tanks to the treatment facility,
- Release of methane from collection systems and treatment facilities, and
- Hauling of biosolids to the final disposal site.

A summary sheet is created as a result of the inputs and the calculations performed in the spreadsheets that support the inventory. The summary sheet is included in the Appendix of this TM, in addition to a listing of all the assumptions applied to complete the analysis.

Figure 1 illustrates the system boundaries used for this analysis.

3.1 Categorize and Identify Sources of GHG Emissions

There are two categories of emissions, direct and indirect, that were identified and evaluated for both the construction phase and the on-going operations phase (annual emissions).

- *Direct emissions* are those resulting from sources owned or controlled by the agency, such as stationary combustion sources, mobile combustion sources, and treatment unit processes. For this inventory, this includes treatment unit process emissions (e.g. septic tank venting).

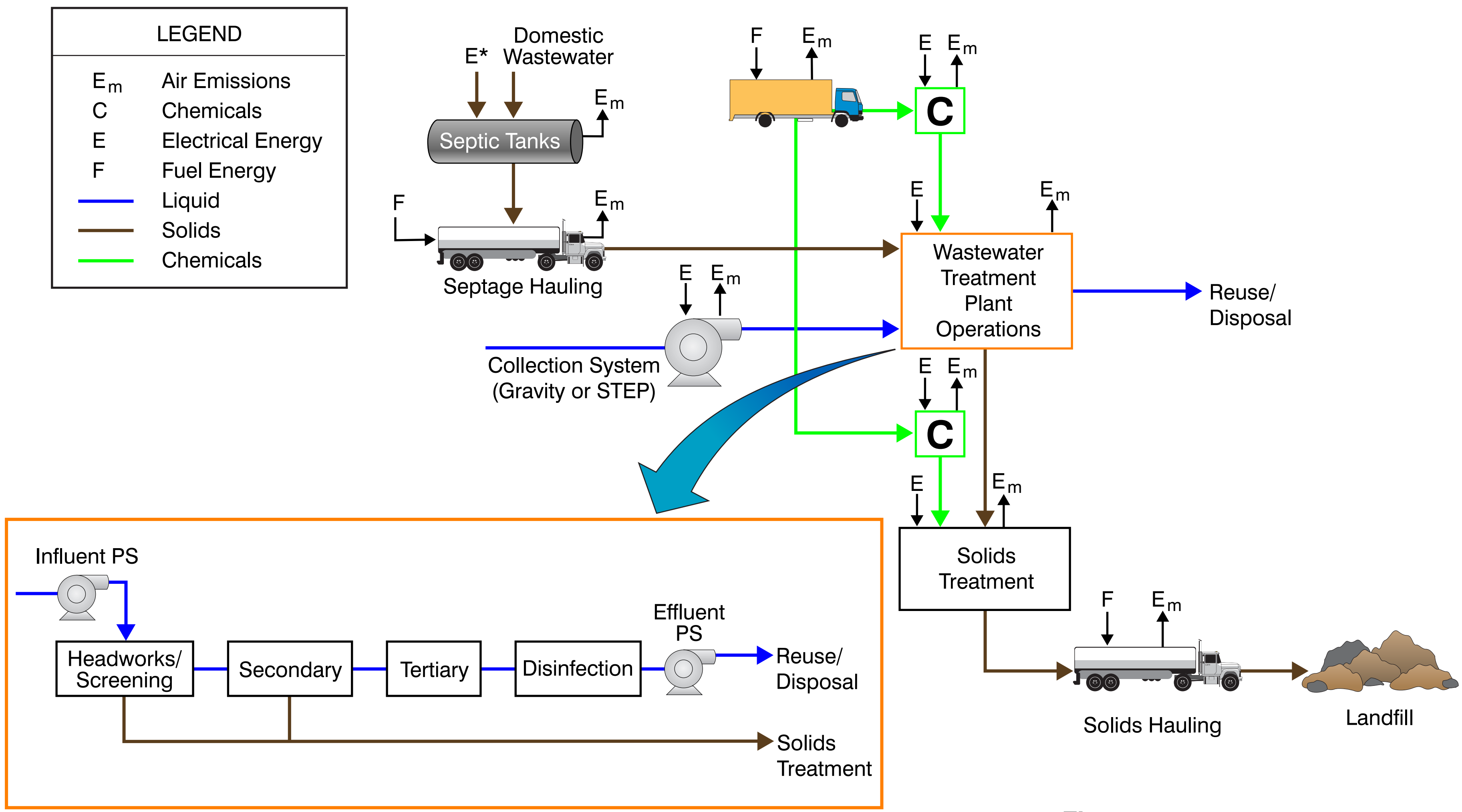

Figure 1
ALTERNATIVES SYSTEM BOUNDARY
LOS OSOS WASTEWATER PROJECT DEVELOPMENT
SAN LUIS OBISPO COUNTY

* Production of STEP Tanks

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- *Indirect emissions* are those originating from the actions of the agency, but are produced by sources owned or controlled by another entity. For this inventory, this includes: use of construction equipment, transport of septage, construction materials, and chemicals to the facilities, transport of biosolids to the disposal site, and purchased and consumed electricity for the operation of the facility, collection system, and the manufacturing of materials and chemicals used in the facility and collection system.

Indirect GHG emissions resulting from the construction phase are annualized over a 30-year time horizon to convert to annual emissions. These were added to the estimated annual GHG emissions resulting from operations to calculate the total annual GHG emissions.

3.2 Estimate GHG Emissions in Terms of "CO_2 Equivalents"

The major sources of GHG emissions were identified and categorized, and appropriate emission factors were determined. The data was then transferred into Carollo's GHG emissions inventory to calculate the quantities of carbon dioxide, methane, and nitrous oxide emissions generated from each source.

- *Electricity consumption (kilowatt-hours) x Emission Factor*
- *Vehicle fuel consumption (gallons or miles traveled) x Emission Factor*
- *Construction Material or Chemical Produced (unit weight) x Specific Energy (unit energy per unit weight of material or chemical) x Emission Factor*
- *Material Produced (unit weight) x Emission Factor*

Emissions were converted into carbon dioxide equivalent (CO_2e) emissions. The major GHG in the atmosphere is carbon dioxide. Other GHGs differ in their ability to absorb heat in the atmosphere. For example, methane (CH_4) has 21 times the capacity to absorb heat relative to carbon dioxide over a hundred-year time horizon, so it is considered to have a global warming potential (GWP) of 21. Nitrous Oxide (N_2O) has 310 times the capacity over a hundred-year time horizon having a GWP of 310. Therefore, a pound of emissions of carbon dioxide is not the same in terms of climatic impact as a pound of methane or nitrous oxide emitted. Carbon dioxide equivalent emissions are calculated by multiplying the amount of emissions of a particular GHG by its GWP (see Table 1).

Example: What is the CO_2e of one ton of methane emissions?

1 ton CH_4 x 21 (GWP, tons CO_2e/tons of CH_4 emitted) = 21 tons CO_2e

Table 1	Greenhouse Gases and Their Associated Global Warming Potentials (GWPs) Los Osos Wastewater Project Development San Luis Obispo County
Greenhouse Gas	**GWP* (unit mass CO_2e/unit mass of GHG emitted)**
Carbon Dioxide (CO_2)	1
Methane (CH_4)	21
Nitrous Oxide (N_2O)	310

* GWPs from the Intergovernmental Panel on Climate Change Second Assessment Report (1996) for a 100-year time horizon. These GWPs are still used today by international convention and the U.S. to maintain the value of the carbon dioxide "currency," and are used in this inventory to maintain consistency with international practice.

4.0 DESCRIPTION OF GHG EMISSIONS ESTIMATES

This section provides a summary of the alternatives being evaluated and brief descriptions of the types of annual GHG emissions considered in this project and the sources of information.

Table 2 provides a summary of the alternative details used as a basis for the GHG inventory. The information provided in Table 2 is based on the alternatives developed in the Viable Project Alternatives Fine Screening Analysis (Fine Screening Analysis). Since the release of the Fine Screening Analysis in August 2007, updates have been made to the alternatives that are considered in this inventory and are presented in the Flows and Loads TM, Septage Receiving Station Option TM, Solids Handling Options TM, and the Partially Mixed Facultative Pond Options TM.

See the Appendix for a listing of assumptions and reference information used to complete the inventory and tables presenting the results of the direct and indirect GHG emissions described below.

4.1 Direct Emissions

4.1.1 <u>Septic Tank Venting</u>

Greenhouse gas (methane) emissions are generated from the anaerobic biodegradation of domestic wastewater within septic tanks in the community. The emissions generated are vented to the atmosphere contributing to the total carbon footprint calculated for the existing system and each project alternative.

Table 2	**Summary of Project Alternative Details Used to Estimate Greenhouse Gas Emissions Los Osos Wastewater Project Development San Luis Obispo County**			
Alternative	**Collection System**	**Treatment Technology**	**Tertiary Treatment Technology***	**Solids Treatment & Disposal**
Alternative 1	Gravity	**Oxidation Ditch** - Headworks, Oxidation Ditches, Secondary Clarifiers, UV Disinfection, Effluent PS**	Nitrification/ Denitrification & Filtration	Sub-Class B Biosolids
Alternative 2	STEP	**Oxidation Ditch** - Headworks, Oxidation Ditches, Secondary Clarifiers, UV Disinfection, Effluent PS	Nitrification/ Denitrification with methanol & Filtration	Sub-Class B Biosolids
Alternative 3	Gravity	**BIOLAC** - Headworks, Biolac Basins, Secondary Clarifiers, UV Disinfection, Effluent PS	Nitrification/ Denitrification & Filtration	Sub-Class B Biosolids
Alternative 4	STEP	**BIOLAC** - Headworks, Biolac Basins, Secondary Clarifiers, UV Disinfection, Effluent PS	Nitrification/ Denitrification with methanol & Filtration	Sub-Class B Biosolids
Alternative 5	Gravity	**ADS Ponds***** - Headworks, ADS Ponds, UV Disinfection, Effluent PS	Nitrification/ Denitrification with methanol & Filtration	Sub-Class B Biosolids
Alternative 6	STEP	**ADS Ponds***** - Headworks, ADS Ponds, UV Disinfection, Effluent PS	Nitrification/ Denitrification with methanol & Filtration	Sub-Class B Biosolids

* Tertiary treatment is not part of the base case project, however it will be considered in future projects since nitrification, denitrification, and/or filtration may be required to meet reuse/disposal water quality requirements.

** PS stands for Pump Station.

*** This inventory considered the Air Diffusion System (ADS) pond option, also known as the Nelson System since Nelson Environmental pioneered the pond system. In the ADS pond option, oxygen and mixing are provided by fine bubble diffusers that are laid out at the bottom of the ponds ensuring oxygen is vertically distributed throughout the pond. Based on the *2006 IPCC Guidelines for National GHG Inventories*, which is followed by the U.S. EPA, if a pond produces an aerobic environment it will produce little or no methane. This inventory assumes the ADS option does not generate any methane emissions. This is a conservative assumption as anaerobic pockets may occur in the accumulated solids, however it is consistent with the IPCC Guidelines.

Estimates of the annual methane emissions vented from septic tanks are included for the prohibition zone only at build-out. Alternatives considering a gravity collection system will not generate this type of emission since the septic tanks will be removed within the prohibition zone. The existing system and project alternatives considering a septic tank effluent pumping (STEP) collection system will have this type of emission within the prohibition zone.

Methane emissions are presented for the STEP collection system alternatives. Per Tables 10 and 11 of the Flows and Loads TM (February 2008), the BOD concentration of raw domestic sewage entering the septic tanks is 340 mg/L, a portion of the BOD remains with the settled solids and a portion leaves with the septic tank effluent, and the BOD concentration remaining in the septic tanks is 200 mg/L. The 200 mg/L BOD remaining in the tank is then converted to methane as the solids are digested. The estimate of annual pounds of BOD remaining in the septic tanks is based on a build-out population projected to be 18,428 and a daily flow per capita estimated to be 60 gallons per day with conservation (Flows and Loads TM, February 2008).

The approach used for calculating septic tank methane emissions are established in the *2006 IPCC Guidelines for National GHG Inventories* which is followed by the U.S. EPA. The approach assumes 16.25 percent of wastewater BOD_5 is anaerobically digested in a septic tank. This proportion of BOD is then multiplied by an emission factor of 0.6 kilograms of methane per kilogram BOD_5.

Odor control devices, such as those produced by Wolverine® for residential use, have been advertised as being capable of reducing methane and hydrogen sulfide emissions. An objective review of this device has shown that the vendor has no data to support the claim of reducing methane emissions.

4.2 Indirect Emissions

4.2.1 <u>Operation of Collection System and Treatment Facilities</u>

Greenhouse gas emissions estimates from the operation of the collection system pump stations and treatment facilities are based on the total annual energy demand (kilowatt-hours per year). The annual energy demands were estimated for the collection system options (gravity and STEP), the pump stations (PS) and treatment processes listed under the treatment technology options, the tertiary treatment options, and the solids treatment options. The total annual energy demand estimates were based on the operation and maintenance (O&M) estimates developed by Carollo Engineers.

Plant staff commuting and the periodic use of equipment for maintenance is not included in this GHG inventory since it is assumed to result in minimal impact relative to the operation of the collection system, pump stations, and treatment system and will not differ significantly among the alternatives.

4.2.2 Construction of the Collection System

Estimates of GHG emissions generated from the construction of the gravity and STEP collection systems were developed using previous estimates of pipeline lengths and Carollo's 3B Conceptual Pipeline Model to estimate material excavation. In order to install the pipeline, sections of roadway need to be removed and replaced. Estimates for roadway removal were also developed and presented in the Fine Screening Report and are considered in this inventory.

Construction crew commuting is not included in this GHG inventory since it is assumed to result in minimal impact relative to the construction and operation of the collection system and pump stations and will not differ significantly among the alternatives

4.2.3 Construction of Treatment Facilities

Estimates of GHG emissions generated from the construction of the treatment facilities were based on materials and processes required for each treatment process included in the project alternatives. The treatment trains for all alternatives consist of an headworks, filtration, ultraviolet (UV) disinfection, and an effluent pump station. The treatment processes that differ among the alternatives are the secondary and nitrification/denitrification processes.

Construction crew commuting is not included in this GHG inventory since it is assumed to result in minimal impact relative to the construction and operation of the treatment system and will not differ significantly among the alternatives

4.2.4 Chemical Production

The California Climate Action Registry General Reporting Protocol (CCAR GRP) considers energy required for the production of chemicals consumed in treatment processes to be outside the boundary of this type of inventory. However, in order to provide a more complete comparison of the impacts of the alternatives, and because of its relative contribution to the overall carbon footprint of the project, the energy consumed for chemical production was included in this inventory. The energy per unit chemical consumed is calculated using conversion factors from the text "Energy in Wastewater Treatment" by William F. Owen. Annual chemical consumption for each alternative is based on estimates developed by Carollo.

4.2.5 Construction Material Handling

Estimates of GHG emissions generated from the transport of construction materials are based on the type of truck used, the type of fuel consumed, and the distance from the materials' distribution center. Carollo applied assumptions for the truck type and fuel type consumed, and based the volume of material to be hauled and the source of materials on Carollo reference projects.

4.2.6 Solids Handling

Estimates of GHG emissions generated from the transport of Sub-Class B biosolids are based on the type of truck used, the type of fuel consumed, and the distance traveled to the disposal site. Per the Solids Handling Options TM, Sub-Class B biosolids are assumed to be hauled to a composting facility, McCarthy Family Farms in Kings County, CA, which is about a 130-mile trip. Carollo applied assumptions for the truck type and the fuel type used, and the disposal site was provided by the County.

4.2.7 Septage Handling

Estimates of GHG emissions for the transport of septage from the community of Los Osos the Los Osos WWTP for the project alternatives are based on several criteria. The criteria include the type of truck used, the type of fuel consumed, the annual number of truck trips required to transport domestic septage for the existing system and each project alternative, and the average distance traveled to the Los Osos WWTP. Carollo applied assumptions for the truck type, the fuel type used, and the average distance from the community's septic tanks to the Los Osos WWTP, while the number of truck trips was estimated per information provided in the Septage Receiving Station Option TM (Carollo, April 2008).

4.2.8 Chemical Handling

Estimates of GHG emissions generated from the transport of chemicals are based on the type of truck used, the type of fuel consumed, and the distance from the chemical's distribution center. Carollo applied assumptions for the truck type and fuel type consumed, and based the source of chemicals on Carollo reference projects.

5.0 EXISTING SYSTEM

The community of Los Osos, California is located on the coastline of Central California adjacent to the Morro Bay State and National Estuary. The existing system relies on privately owned septic tanks for its approximately 14,600 residents. The State Water Resources Control Board's On-Site Wastewater Treatment System Regulations (Assembly Bill 885, AB 885) will require that all septic tanks be pumped and inspected once every five years. For this inventory, GHG emissions related to the manufacturing, transport, and installation of the existing septic tanks are not included. It is assumed that the septic tanks will be pumped every five years and the septage will continue to be hauled to the Santa Maria WWTP. The BOD remaining in the septic tanks is converted into methane through anaerobic digestion and is vented to the atmosphere.

6.0 SUMMARY OF GHG EMISSIONS ESTIMATES FOR ALTERNATIVES

As part of the evaluation of the existing system and the project alternatives, GHG emissions estimates were developed. The resulting annual GHG emissions estimated for the construction and operation of each alternative are summarized in Figure 2 and Table 3. The differences in annual generation of GHG emissions among the alternatives are primarily drawn from energy consumption, chemical production, and methane generation. Greenhouse gas emissions resulting from construction processes and material handling are also presented as a “one-time” emission in Figure 3 and Table 4.

6.1 Annual GHG Emissions

6.1.1 Energy Consumption

Energy consumed for the operations of both the collection system and treatment facility is considered. This category represents the annual electricity consumed for daily operations.

- The STEP collection system alternatives overall are the least energy intensive options. The STEP collection system alternatives can be considered nearly the same in energy consumption due to the uncertainty associated with these types of analyses.
- The Oxidation Ditch alternative in combination with the gravity collection system is the most energy intensive primarily due to the energy consumed for the oxidation ditch treatment process.
- The Biolac alternative in combination with the STEP collection system is the least energy intensive option.

6.1.2 Chemical Production

As mentioned in section 6.1.2, the alternatives served by gravity result in significantly less emissions than those served by STEP. This is also in part due to the STEP alternatives and the gravity ADS Pond alternative requiring more chemicals (i.e., methanol) for treatment purposes. Methanol serves as a carbon source in the denitrification process, and requires an energy intensive process for its production that leads to generation of indirect GHG emissions.

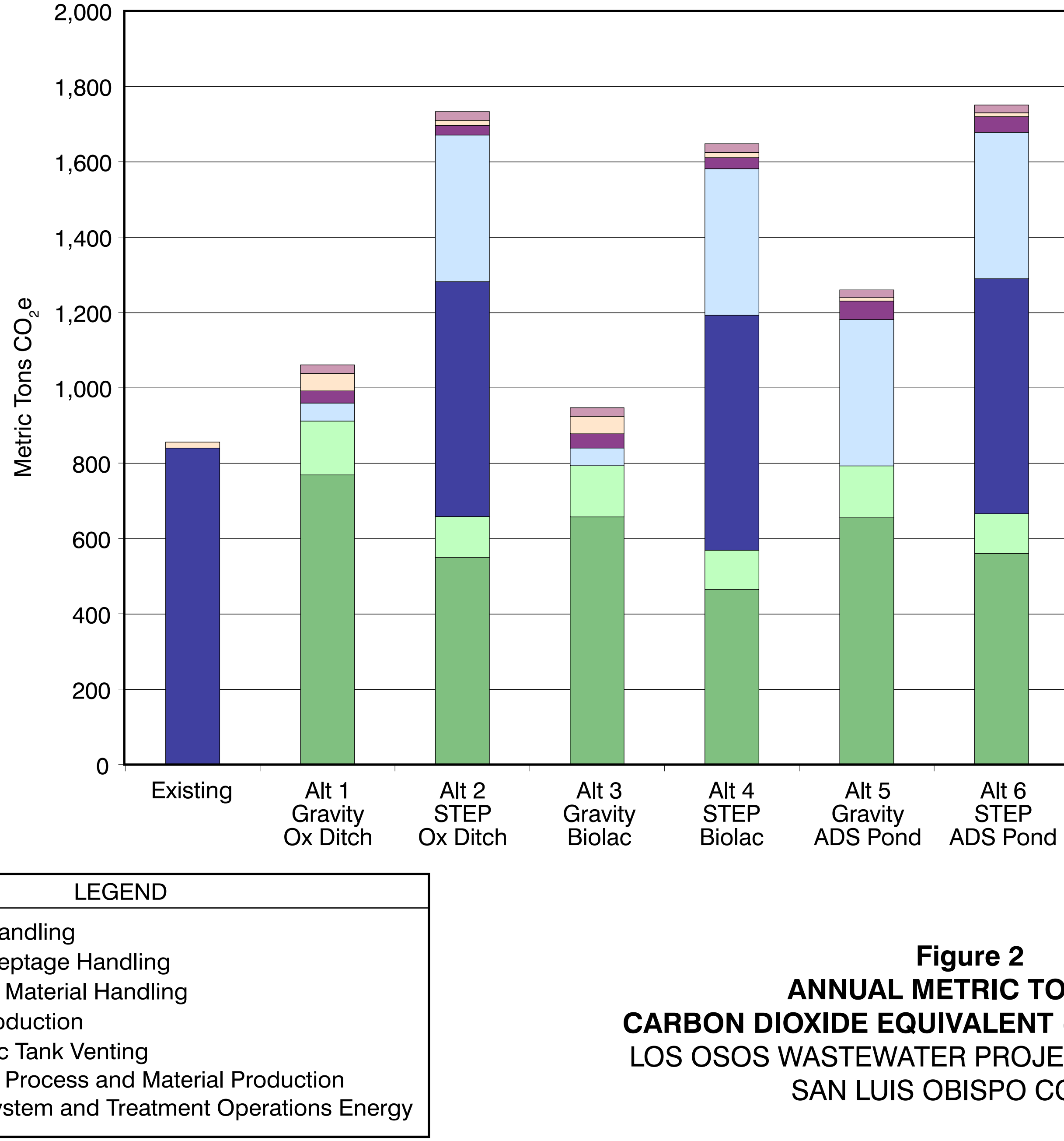

Figure 2
ANNUAL METRIC TONS OF
CARBON DIOXIDE EQUIVALENT (CO_2e) EMISSIONS
LOS OSOS WASTEWATER PROJECT DEVELOPMENT
SAN LUIS OBISPO COUNTY

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Table 3 Annual Total Metric Tons of Carbon Dioxide Equivalent (CO_2e) Emissions
Los Osos Wastewater Project Development
San Luis Obispo County

Alternative	INDIRECT						DIRECT	TOTAL Metric Tons CO_2e Emissions per year
	Collection System & Treatment Operations Energy	Construction Process & Material Production	Chemical Production	Construction Material Handling	Solids & Septage Handling	Chemicals Handling	STEP - Septic Tank Venting	
Existing	0	0	0	0	16	0	840	**856**
Alt 1 - Gravity Ox Ditch	769	143	48	32	47	22	0	**1,061**
Alt 2 - STEP Ox Ditch	549	103	389	22	14	23	624	**1,724**
Alt 3 - Gravity Biolac	657	136	47	38	47	22	0	**947**
Alt 4 - STEP Biolac	464	99	389	26	14	23	624	**1,639**
Alt 5 - Gravity ADS Pond	655	138	389	49	9	20	0	**1,260**
Alt 6 - STEP ADS Pond	560	100	389	39	10	21	624	**1,742**

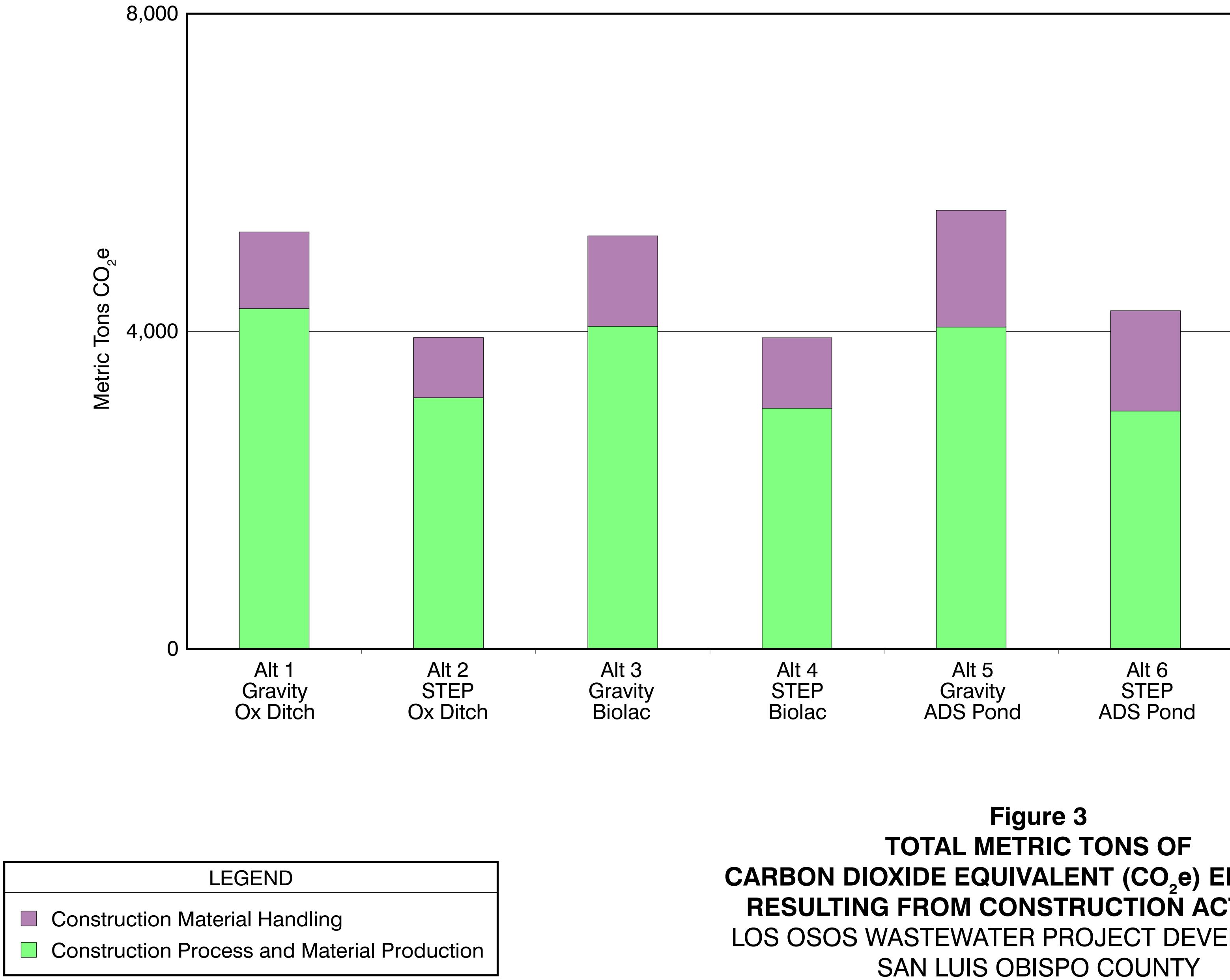

Figure 3
TOTAL METRIC TONS OF CARBON DIOXIDE EQUIVALENT (CO_2e) EMISSIONS RESULTING FROM CONSTRUCTION ACTIVITIES
LOS OSOS WASTEWATER PROJECT DEVELOPMENT
SAN LUIS OBISPO COUNTY

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Table 4	Total Metric Tons of Carbon Dioxide Equivalent (CO_2e) Emissions Resulting from Construction Activities Los Osos Wastewater Project Development San Luis Obispo County		
	Indirect		
	Construction Process and Material Production	Construction Material Handling	Total Metric Tons CO_2e Emissions
Existing	0	0	**0**
Alt 1 - Gravity Ox Ditch	4,286	965	**5,251**
Alt 2 - STEP Ox Ditch	3,088	656	**3,744**
Alt 3 - Gravity Biolac	4,064	1,139	**5,203**
Alt 4 - STEP Biolac	2,955	786	**3,740**
Alt 5 - Gravity ADS Pond	4,055	1,469	**5,524**
Alt 6 - STEP ADS Pond	2,919	1,163	**4,082**

6.1.3 Methane Generation

The alternatives served by gravity result in significantly less emissions than those served by STEP. This is because septic tanks throughout the STEP collection system vent large amounts of methane annually due to the anaerobic digestion of settled solids within the tanks. Remember that methane has a GWP 21 times that of carbon dioxide.

6.2 Total Construction GHG Emissions

Total (or one-time) construction GHG emissions refer to the total emissions generated from construction processes and material handling without annualizing the emissions over the 30-year time horizon. These “one-time” emissions are presented in Figure 3 and Table 4.

These results show a different outcome due to the difference in materials (production and handling) and processes required for the construction of the collection systems and treatment processes for each alternative. Due to the uncertainty associated with these types of analyses, the material production and onsite construction processes are considered the same across alternatives served by the same type of collection system. However, the material handling (in other words, the transport of materials) varies across the alternatives due to the different sources or disposal locations of the materials.

6.3 Summary

In summary, for gravity collection system alternatives, the Biolac alternative generates the least GHG emissions compared to the Oxidation Ditch and ADS Pond alternatives. This is due to the alternative’s low chemical use and absence of septic tanks or other treatment process that would lead to methane generation and venting. However, for the STEP collection system alternatives, due to the uncertainty in these analyses, the levels of GHG emissions generated by each of the alternatives are considered nearly the same.

APPENDIX - ASSUMPTIONS AND GHG SUMMARY TABLES

APPENDIX - ASSUMPTIONS AND GHG SUMMARY TABLES

ELECTRICITY CONSUMPTION FOR OPERATIONS

- Treatment estimates include secondary treatment technology, nitrification/denitrification, tertiary treatment, and solids treatment.
- Pump station estimates include residential on-lot pumps (STEP system) or collection system pump stations (gravity system).
- Alternatives include community septage only at buildout for the prohibition zone.
- Existing system considers the existing septic tanks pumped every five years and the septage will continue to be hauled to the Santa Maria WWTP.
- Alternative 1 (Gravity Ox Ditch) system includes headworks/screening/septage receiving, oxidation ditch, secondary sedimentation, UV disinfection, and effluent pumping.
- Alternative 2 (STEP Ox Ditch) system includes headworks/screening/septage receiving, oxidation ditch, secondary sedimentation, UV disinfection, and effluent pumping.
- Alternative 3 (Gravity BIOLAC) system includes headworks/screening/septage receiving, BIOLAC process, secondary sedimentation, UV disinfection, and effluent pumping.
- Alternative 4 (STEP BIOLAC) system includes headworks/screening/septage receiving, BIOLAC process, secondary sedimentation, UV disinfection, and effluent pumping.
- Alternative 5 (Gravity ADS pond) system includes headworks/screening/septage receiving, ADS ponds, UV disinfection, and effluent pumping.
- Alternative 6 (STEP ADS pond) system includes headworks/screening/septage receiving, ADS ponds, UV disinfection, and effluent pumping.
- Solids treatment for all alternatives assumes thickening, dewatering, and hauling of subclass B solids to a landfill.
- Air Diffusion System ponds and Partially Mixed Facultative Ponds produce an aerobic environment, and therefore will produce little or no methane per *2006 IPCC Guidelines for National GHG Inventories*.

- Plant staff commuting and the periodic use of equipment for maintenance is not included in this GHG inventory since it is assumed to result in minimal impact relative to the operation of the collection system, pump stations, and treatment system and will not differ significantly among the alternatives.

CONSTRUCTION MATERIALS AND PROCESSES

- Gravity collection system construction includes installation of sewers and force mains, pump stations, laterals in right-of-way, on-lot laterals, removal of septic tanks, and roadway removal and materials.

- STEP collection system construction includes installation of sewers and force mains, laterals in right-of-way, on-lot laterals, removal and installation of septic tanks, and roadway removal and materials.

- STEP tank supplier is assumed to be Orenco System Inc. The local distributor is Bio-solutions in Agoura Hills, CA, and the tanks are assumed to be hauled 33 (unassembled, 11 high and 3 stacks) at a time on a step-deck truck to the Los Osos WWTP.

- STEP tanks are assumed to be placed with four (4) feet of cover, with 6" of aggregate base.

- For the installation of the STEP collection system, existing septic tanks will either be abandoned or removed (if the STEP tanks will be installed in the same location). The disposal of the removed septic tanks is not included in this inventory.

- Gravity and STEP collection system construction does not include manufacturing of pump or pump station equipment.

- The gravity collection system options will be installed using open trenching. Pipe lengths are based on the "Los Osos Wastewater Project Area A, B, C, & D - Bid Schedule" and the Fine Screening Report, assuming 4,769 connections and 12,000 feet of 18" diameter pipe from the central pump station to the out of town treatment facility (probable route).

- The STEP collection system options will be installed using horizontal directional drilling (HDD), pipe lengths are based on Ripley Pacific Team Los Osos Wastewater Management Plan Update (July 2006) and the Fine Screening Report, assuming 4,769 connections and 12,000 feet of 14" diameter pipe from a central location in town to the out of town treatment facility.

- Excavated material quantities for the collection system were calculated based on Carollo reference projects and the Carollo 3B pipeline model.

- Excavated material for the installation of the collection system pipeline will be reused onsite as backfill.
- Excavated material for construction of treatment facilities will be reused onsite as backfill. Excess excavated material will be off-hauled to the Cold Canyon landfill via 23-ton truck (assumed the same landfill as that used for solids disposal).
- Assuming the installation of laterals and the out of town conveyance will not require the removal or replacement of pavement or aggregate base.
- Biolac lining requirements are based on a Carollo reference project.
- Concrete, excavation, and backfill estimates for treatment construction are based on construction estimates prepared by Carollo.
- Assuming asphalt will be transported from Santa Maria, CA in 7.5 cubic yard capacity trucks.
- Aggregate base assumed to be supplied from Santa Maria, CA in 16 cubic yard capacity trucks.
- Assuming concrete will be transported from San Luis Obispo in trucks with 10 cubic yard capacity.
- Riprap will be hauled 18 tons per truckload to the Los Osos WWTP from Santa Maria, CA.
- The generation of construction material waste will not be significantly different across the alternatives and will result in minimal impact.
- Construction crew commuting is not included in this GHG inventory since it is assumed to result in minimal impact relative to the construction and operation of the collection system, pump stations, and treatment system and will not differ significantly among the alternatives.

CHEMICAL CONSUMPTION & HANDLING

- Assuming polymer for thickening and dewatering is 40% active.
- Information for polymer was provided by Nalco Chemicals Co. Polymer is assumed to be supplied in 250-gallon totes, delivered by carrier truck with an average capacity of 11 totes, and assumed shelf-life is 6 months. Minimum delivery frequency of 4 months is assumed.
- Quantities of polymer, alum, and methanol are based on the O&M estimates prepared by Carollo.

- Assuming that odor control chemicals will only be needed at the headworks and the thickening/dewatering building per Carollo reference projects.

- Typical building sizes were assumed for the headworks and thickening/dewatering buildings; air space to be treated is estimated at 90,000 cubic feet for the headworks and 25,000 cubic feet for the thickening/dewatering building. Sodium hydroxide concentration is 50% and sodium hypochlorite concentration at 12.5% based on Carollo reference project odor control system by RJ Environmental.

- Three-stage, packaged odor control scrubbers using sodium hydroxide and sodium hypochlorite were assumed.

- Sodium hypochlorite and sodium hydroxide suppliers are assumed to be located in Los Angeles, CA, and delivered via a 6,800-gallon tanker truck. Sodium hypochlorite shelf-life is 2 weeks per Carollo reference projects.

- Chemicals used for UV lamp cleaning are assumed to be negligible.

- Methanol is assumed to be supplied from Unibar (Fresno, CA) and delivered via a tanker truck with a capacity of 45,000 lbs (or 6,800 gallons).

- Assuming alum is 47% active, supplied in a 48,000 lb capacity tanker truck. Supplier is assumed to be located in Los Angeles per Carollo reference projects.

BIOSOLIDS & SEPTAGE HANDLING RESULTING FROM OPERATIONS

- Trucks hauling septage are assumed to be tankers with a 3000-gallon capacity per Septage Receiving Station Option TM, April 2008.

- Septage is assumed to travel 3 miles one-way to the Los Osos WWTP per Carollo estimate based on capacity of truck and average distance from community septic tanks to the WWTP.

- At build-out no septic tanks will exist within the prohibition zone for the gravity collection system project alternatives per Septage Receiving Station Option TM, April 2008.

- At build-out all septic tanks within the prohibition zone for the STEP collection system will contain 200 mg/L BOD in the septage. Per the Flows and Loads TM, the septic tank influent is 340 mg/L and a portion of the BOD is assumed to leave the septic tank.

- Population at build-out is estimated to be 18,428 and the daily flow per capita is estimated to be about 60 gallons per capita per day with conservation per the Flows and Loads TM, Table 6, February 2008.

- 16.25% of wastewater BOD_5 is anaerobically digested in septic tanks per "Improvements to the U.S. Wastewater Methane and Nitrous Oxide Emissions Estimates," U.S. EPA, Elizabeth A. Scheehle and Michiel R.J. Doorn.

- Trucks hauling solids are assumed to be enclosed long-bed trailers with a 40,000 lb capacity per the Biosolids Handling Options TM, April 2008.

- Hauling of sub-class B biosolids requires four trucks per week for the gravity collection system and one truck per week for the STEP collection system per the Biosolids Handling Options TM, April 2008.

The following tables summarize the GHG emissions generated by category for the existing system and the project alternatives. Brief explanations of the results of each table follow.

GHG EMISSIONS SUMMARY

Refer to CCAR:GRP 2007, Appendix C, for Emission Factors.	Subregion Electricity Emission Factors, gCO_2e/kWh	Petroleum Fuel Emission Factors, kg/MMBtu	Natural Gas Emission Factors, kg/MMBtu
Carbon Dioxide (CO_2)	364.9	62.30	53.05
Methane (CH_4)	0.0638	0.002	0.0059
Nitrous Oxide (N_2O)	0.5202	0.0006	0.0001

Legend
Inputs
Calculations
Carried Over
Not applicable

	Global Warming Potential
Carbon Dioxide (CO_2)	1
Methane (CH_4)	21
Nitrous Oxide (N_2O)	310

INDIRECT EMISSIONS

Table 1. CO_2-Equivalent Emissions Resulting from Electricity Consumption for Operation of the Treatment Facility & Pumping Stations

	Annual Electricity Consumption (kWh)	Multiply by Average Emission Factor, gCO_2e			Total CO_2e Emissions not including T&D Loss		Total CO_2e Emissions including T&D Loss
		Carbon Dioxide	Methane	Nitrous Oxide	gCO_2e	Metric Tons CO_2e	Metric Tons CO_2e
Existing	0	0	0	0	0	0	**0**
Alt 1 - Gravity Ox Ditch	1,934,998	706,144,446	123,492	1,006,500	707,274,438	707	**769**
Alt 2 - STEP Ox Ditch	1,382,920	504,673,017	88,258	719,333	505,480,608	505	**549**
Alt 3 - Gravity Biolac	1,654,383	603,738,799	105,583	860,536	604,704,918	605	**657**
Alt 4 - STEP Biolac	1,168,920	426,577,374	74,601	608,020	427,259,995	427	**464**
Alt 5 - Gravity ADS Pond	1,648,651	601,647,003	105,218	857,555	602,609,775	603	**655**
Alt 6 - STEP ADS Pond	1,410,123	514,600,287	89,995	733,483	515,423,764	515	**560**

Table 2. Annualized CO_2 Equivalent Emissions Resulting from the Processing and Production of Construction Materials over a 30-year Time Horizon

	CO_2e Generated per Process & Material Produced						
Material Name	**Existing**	**Alt 1 - Gravity Ox Ditch**	**Alt 2 - STEP Ox Ditch**	**Alt 3 - Gravity Biolac**	**Alt 4 - STEP Biolac**	**Alt 5 - Gravity ADS Pond**	**Alt 6 - STEP ADS Pond**
Treatment - Concrete	0	22,319,161	20,006,459	14,157,381	15,127,607	7,639,046	7,417,280
Treatment - Earthwork	0	203,466	220,599	860,886	597,393	5,454,224	5,461,539
Septic Tanks	0	0	12,690,162	0	12,690,162	0	12,690,162
Collection System	0	18,912,063	1,245,652	18,912,063	1,245,652	18,912,063	1,245,652
Lining - Polyethylene	0	0	0	298,124	203,291	1,860,131	1,860,131
Piping - PVC	0	101,425,680	68,770,191	101,425,680	68,770,191	101,425,680	68,770,191
LDPE (2% Black C) Tubing	0	0	0	0	0	2,212,939	2,212,939
Total Metric Tons CO_2e:	**0**	**143**	**103**	**136**	**99**	**138**	**100**

In grams...

In Metric Tons...

Table 3. Total CO_2 Equivalent Emissions Resulting from the Processing and Production of Construction Materials

	CO_2e Generated per Process & Material Produced							
Material Name	**Factor for 30-year Time Horizon**	**Existing**	**Alt 1 - Gravity Ox Ditch**	**Alt 2 - STEP Ox Ditch**	**Alt 3 - Gravity Biolac**	**Alt 4 - STEP Biolac**	**Alt 5 - Gravity ADS Pond**	**Alt 6 - STEP ADS Pond**
Treatment - Concrete	1.0	0	669,574,835	600,193,766	424,721,440	453,828,224	229,171,373	222,518,394
Treatment - Earthwork	1.0	0	6,103,983	6,617,964	25,826,565	17,921,775	163,626,709	163,846,183
Septic Tanks	1.0	0	0	380,704,864	0	380,704,864	0	380,704,864
Collection System	1.0	0	567,361,877	37,369,547	567,361,877	37,369,547	567,361,877	37,369,547
Lining - Polyethylene	3.0	0	0	0	2,981,241	2,032,912	18,601,311	18,601,311
Piping - PVC	1.0	0	3,042,770,396	2,063,105,724	3,042,770,396	2,063,105,724	3,042,770,396	2,063,105,724
LDPE (2% Black C) Tubing	2.0	0	0	0	0	0	33,194,090	33,194,090
Total Metric Tons CO_2e:		**0**	**4,286**	**3,088**	**4,064**	**2,955**	**4,055**	**2,919**

In grams...

In Metric Tons...

Table 4. CO_2 Equivalent Emissions Resulting from the Production of Chemicals

Chemical Name	CO$_2$e Generated per Chemical Produced						
	Existing	Alt 1 - Gravity Ox Ditch	Alt 2 - STEP Ox Ditch	Alt 3 - Gravity Biolac	Alt 4 - STEP Biolac	Alt 5 - Gravity ADS Pond	Alt 6 - STEP ADS Pond
Sodium Hypochlorite	0	12,062,971	12,062,971	12,062,971	12,062,971	12,062,971	12,062,971
Sodium Hydroxide	0	20,531,083	20,531,083	20,531,083	20,531,083	20,531,083	20,531,083
Polymer - Thickening	0	1,590,744	426,785	1,357,952	329,788	0	0
Polymer - Dewatering	0	4,772,231	1,280,355	4,073,856	989,365	975,515	819,432
Alum	0	5,401,095	5,431,954	5,401,095	5,431,954	5,401,095	5,431,954
Filter Polymer	0	3,597,111	3,617,307	3,597,111	3,617,307	3,597,111	3,617,307
Methanol	0	0	346,060,631	0	346,060,631	346,060,631	346,060,631
Total Metric Tons CO$_2$e:	**0**	**48**	**389**	**47**	**389**	**389**	**389**

Table 5. Annualized CO_2-Equivalent Emissions Resulting from Fuel Consumption for Construction Material Handling over a 30-year Time Horizon

	Annual VMT*	Annual Gallons Diesel	Carbon Dioxide (kg CO2/year)	Methane (g CO2e/year)	Nitrous Oxide (g CO2e/year)	Total CO2e Emissions kilograms/year	Total CO2e Emissions Metric Tons/year
Existing	0	0	0	0	0	0	**0**
Alt 1 - Gravity Ox Ditch	18,137	3,210	31,972	22,852	281,118	32,276	**32**
Alt 2 - STEP Ox Ditch	12,299	2,177	21,682	15,497	190,641	21,888	**22**
Alt 3 - Gravity Biolac	21,380	3,784	37,689	26,939	331,389	38,048	**38**
Alt 4 - STEP Biolac	14,713	2,604	25,936	18,538	228,046	26,183	**26**
Alt 5 - Gravity ADS Pond	27,569	4,879	48,599	34,737	427,319	49,062	**49**
Alt 6 - STEP ADS Pond	21,784	3,856	38,401	27,448	337,649	38,766	**39**

*Vehicle-miles traveled, VMT

Table 6. Total CO_2-Equivalent Emissions Resulting from Fuel Consumption for Construction Material Handling

	Total VMT*	Total Gallons Diesel	Carbon Dioxide (kg CO2e)	Methane (g CO2e)	Nitrous Oxide (g CO2e)	Total CO2e Emissions kilograms	Total CO2e Emissions Metric Tons
Existing	0	0	0	0	0	0	**0**
Alt 1 - Gravity Ox Ditch	364,965	96,301	959,156	459,857	5,656,965	965,273	**965**
Alt 2 - STEP Ox Ditch	338,477	65,307	650,455	426,482	5,246,400	656,128	**656**
Alt 3 - Gravity Biolac	495,054	113,522	1,130,678	623,769	7,673,344	1,138,975	**1,139**
Alt 4 - STEP Biolac	443,664	78,120	778,078	559,017	6,876,791	785,514	**786**
Alt 5 - Gravity ADS Pond	680,725	146,384	1,457,985	857,714	10,551,244	1,469,394	**1,469**
Alt 6 - STEP ADS Pond	655,798	115,666	1,152,036	826,306	10,164,874	1,163,027	**1,163**

*Vehicle-miles traveled, VMT

Table 7. CO_2-Equivalent Emissions Resulting from Fuel Consumption for Solids & Septage Handling

	Annual VMT*	Annual Gallons Diesel	Carbon Dioxide (kg CO2/year)	Methane (g CO2e/year)	Nitrous Oxide (g CO2e/year)	Total CO2e Emissions kilograms/year	Total CO2e Emissions Metric Tons/year
Existing	8,827	1,562	15,560	11,122	136,813	15,708	**16**
Alt 1 - Gravity Ox Ditch	26,180	4,634	46,151	32,987	405,787	46,589	**47**
Alt 2 - STEP Ox Ditch	7,824	1,385	13,793	9,859	121,277	13,924	**14**
Alt 3 - Gravity Biolac	26,180	4,634	46,151	32,987	405,787	46,589	**47**
Alt 4 - STEP Biolac	7,824	1,385	13,793	9,859	121,277	13,924	**14**
Alt 5 - Gravity ADS Pond	5,151	912	9,080	6,490	79,837	9,166	**9**
Alt 6 - STEP ADS Pond	5,500	973	9,695	6,930	85,249	9,788	**10**

*Vehicle-miles traveled, VMT

Table 8. CO_2-Equivalent Emissions Resulting from Fuel Consumption for Chemicals Handling

	Annual VMT*	Annual Gallons Diesel	Carbon Dioxide	Methane	Nitrous Oxide	Total CO2e Emissions	
			(kg CO2/year)	(g CO2e/year)	(g CO2e/year)	kilograms/year	Metric Tons/year
Existing	0	0	0	0	0	0	**0**
Alt 1 - Gravity Ox Ditch	15,552	2,222	22,128	19,596	241,056	22,389	**22**
Alt 2 - STEP Ox Ditch	15,842	2,273	22,639	19,961	245,551	22,905	**23**
Alt 3 - Gravity Biolac	15,552	2,222	22,128	19,596	241,056	22,389	**22**
Alt 4 - STEP Biolac	15,842	2,273	22,639	19,961	245,551	22,905	**23**
Alt 5 - Gravity ADS Pond	14,232	2,033	20,250	17,932	220,596	20,489	**20**
Alt 6 - STEP ADS Pond	14,522	2,084	20,761	18,298	225,091	21,005	**21**

*Vehicle-miles traveled, VMT

DIRECT EMISSIONS

Table 9. CO_2-Equivalent Emissions Venting directly from Septic Tanks

	Annual lbs of BOD Digested in Septic Tanks	Methane	Total CO2e Emissions	
		(kg CH4/year)	kilograms/year	Metric Tons/year
Existing	146,690	40,006	840,132	**840**
Alt 1 - Gravity Ox Ditch	0	0	0	**0**
Alt 2 - STEP Ox Ditch	108,912	29,703	623,769	**624**
Alt 3 - Gravity Biolac	0	0	0	**0**
Alt 4 - STEP Biolac	108,912	29,703	623,769	**624**
Alt 5 - Gravity ADS Pond	0	0	0	**0**
Alt 6 - STEP ADS Pond	108,912	29,703	623,769	**624**

TOTAL (Indirect + Direct) EMISSIONS

Table 10. Summary Table - Annual Total Metric Tons of Carbon Dioxide Equivalent Emissions

	INDIRECT						DIRECT	
	Collection System & Treatment Operations Energy	Construction Process & Material Production	Chemical Production	Construction Material Handling	Solids & Septage Handling	Chemicals Handling	STEP - Septic Tank Venting	TOTAL Metric Tons CO_2e Emissions
Existing	0	0	0	0	16	0	840	**856**
Alt 1 - Gravity Ox Ditch	769	143	48	32	47	22	0	**1,061**
Alt 2 - STEP Ox Ditch	549	103	389	22	14	23	624	**1,724**
Alt 3 - Gravity Biolac	657	136	47	38	47	22	0	**947**
Alt 4 - STEP Biolac	464	99	389	26	14	23	624	**1,639**
Alt 5 - Gravity ADS Pond	655	138	389	49	9	20	0	**1,260**
Alt 6 - STEP ADS Pond	560	100	389	39	10	21	624	**1,742**

Table 11. Summary Table - Total Metric Tons of Carbon Dioxide Equivalent Emissions due to Construction Activities

	INDIRECT		
	Construction Process & Material Production	Construction Material Handling	TOTAL Metric Tons CO_2e Emissions
Existing	0	0	**0**
Alt 1 - Gravity Ox Ditch	4,286	965	**5,251**
Alt 2 - STEP Ox Ditch	3,088	656	**3,744**
Alt 3 - Gravity Biolac	4,064	1,139	**5,203**
Alt 4 - STEP Biolac	2,955	786	**3,740**
Alt 5 - Gravity ADS Pond	4,055	1,469	**5,524**
Alt 6 - STEP ADS Pond	2,919	1,163	**4,082**

INDIRECT EMISSIONS

Recall *indirect emissions*, consistent with the CCAR protocol, are those originating from the actions of the agency, but are produced by sources owned or controlled by another entity. For this inventory, this includes: use of construction equipment, manufacturing and transport of the STEP tanks, transport of septage, construction materials, and chemicals to the facilities, transport of biosolids to the disposal site, and purchased and consumed electricity for the operation of the facility, collection system, and the manufacturing of materials and chemicals used in the facility and collection system.

Table 1. Carbon Dioxide Equivalent (CO_2e) Emissions Resulting from Electricity Consumption for Operation of the Treatment Facility & Pumping Stations

This table shows the carbon dioxide, methane, and nitrous oxide emissions generated from the production and delivery of electricity based on estimated demands at buildout, which is consumed for the operation of the treatment facility and pumps throughout the collection systems. The existing system does not require electricity and therefore does not generate CO_2e emissions in this category. In general, the alternatives considering a gravity collection system consume more electrical energy than the STEP alternatives due to variation in unit process sizing and the slight difference in collection system energy requirements. Alternative 1 (oxidation ditch alternative with a gravity collection system) is the most energy intensive primarily due to the oxidation ditch process energy consumption. Alternative 6 (air diffusing system pond alternative with a STEP collection system) is the least energy consuming alternative and is closely followed by Alternative 4 (Biolac alternative with a STEP collection system).

Table 2. Annualized Carbon Dioxide Equivalent (CO_2e) Emissions Resulting from the Processing and Production of Construction Materials over a 30-year Time Horizon

This table shows the carbon dioxide, methane, and nitrous oxide emissions generated from the processing and production of construction materials, which are consumed for the construction of the treatment facility and each collection system based on estimated demands at buildout, annualized over a 30-year period. The construction material processes considered are the excavation and backfill processes for the treatment facility (treatment), the septic tanks, and the collection system. The construction materials for which material production (energy consumed for production processes) is evaluated are concrete, fiberglass, polyethylene lining, PVC piping, and low-density polyethylene tubing.

The existing system does not require new construction and therefore does not generate CO_2e emissions in this category. In general, the alternatives considering a gravity collection system generate more CO_2e emissions than the STEP alternatives due to less demand for the construction of the STEP collection system and variation in unit process sizing. Alternative 1 (oxidation ditch alternative with a gravity collection system) generates the most CO_2e emissions primarily due to the PVC piping production required. Alternatives 2, 4, and 6 (alternatives served by a STEP collection system) generate the least CO_2e emissions in this category.

Table 3. Total Carbon Dioxide Equivalent (CO_2e) Emissions Resulting from the Processing and Production of Construction Materials

This table shows the total carbon dioxide, methane, and nitrous oxide emissions generated from the processing and production of construction materials, which are consumed for the construction of the treatment facility and each collection system based on estimated demands at buildout. The construction material processes considered are the excavation and backfill processes for the treatment facility (treatment), the septic tanks, and the collection system. The construction materials for which material production (energy consumed for production processes) is evaluated are concrete, fiberglass, polyethylene lining, PVC piping, and low-density polyethylene tubing.

The existing system does not require new construction and therefore does not generate CO_2e emissions in this category. In general, the alternatives considering a gravity collection system generate slightly more CO_2e emissions than the STEP alternatives due to less demand for the construction of the STEP collection system and variation in unit process sizing. Alternative 1 (oxidation ditch alternative with a gravity collection system) generates the most CO_2e emissions primarily due to the PVC piping production required. Alternatives 2, 4, and 6 (alternatives served by a STEP collection system) generate the least CO_2e emissions in this category.

Table 4. Carbon Dioxide Equivalent (CO_2e) Emissions Resulting from the Production of Chemicals

This table shows the carbon dioxide, methane, and nitrous oxide emissions generated from the production (resulting from the energy consumed for production processes) of chemicals, which are required for odor control and treatment based on estimated demands of the alternatives at buildout. The chemicals include sodium hypochlorite, sodium hydroxide, thickening polymer, dewatering polymer, alum, filter polymer, and methanol.

The existing system does not require the use of chemicals and therefore does not generate CO_2e emissions in this category. In general, the alternatives considering a STEP collection system generate more CO_2e emissions than the gravity collection system alternatives (with the exception of Alternative 5) due to the methanol requirements of the denitrification process.

Table 5. Annualized Carbon Dioxide Equivalent (CO_2e) Emissions Resulting from Fuel Consumption for Construction Material Handling over a 30-year Time Horizon

This table shows the carbon dioxide, methane, and nitrous oxide emissions generated from the transport of construction materials, which are consumed for the construction of the treatment facility and each collection system based on estimated demands at buildout, annualized over a 30-year period. The construction materials for which material handling (transport of materials from distributor and to disposal site) is considered are concrete, fiberglass, polyethylene lining, PVC piping, low-density polyethylene tubing, and remaining excavated material.

The existing system does not require new construction and therefore does not generate CO_2e emissions in this category. In general, the alternatives considering a STEP collection system generate less CO_2e emissions than the gravity collection system alternatives due to the handling of excavated material.

Table 6. Total Carbon Dioxide Equivalent (CO_2e) Emissions Resulting from Fuel Consumption for Construction Material Handling

This table shows the total carbon dioxide, methane, and nitrous oxide emissions generated from the transport of construction materials, which are consumed for the construction of the treatment facility and each collection system based on estimated demands at buildout. The construction materials for which material handling (transport from material distributor and/or to disposal site) is considered are concrete, fiberglass, polyethylene lining, PVC piping, low-density polyethylene tubing, and remaining excavated material.

The existing system does not require new construction and therefore does not generate CO_2e emissions in this category. In general, the alternatives considering a STEP collection system generate less CO_2e emissions than the gravity collection system alternatives due to the handling of the excavated material.

Table 7. Carbon Dioxide Equivalent (CO_2e) Emissions Resulting from Fuel Consumption for Solids & Septage Handling

This table shows the carbon dioxide, methane, and nitrous oxide emissions generated from the handling (transport) of solids and septage, which are generated at the treatment facility and in the septic tanks of the existing and STEP collection system alternatives based on estimated demands at buildout. The existing system's septage is hauled to the Santa Maria Wastewater Treatment Plant (WWTP), while the septage generated in STEP collection system is hauled to the Los Osos WWTP. Solids generated at the Los Osos WWTP are hauled to McCarthy Family Farms in Kings County, CA.

Alternatives 1 (oxidation ditch with gravity collection system) and 3 (Biolac with gravity collection system) generate more CO_2e emissions than the other alternatives due to the volume of septage and solids generated at the septic tanks and plant, respectively, which subsequently have to be transported to a disposal site.

Table 8. Carbon Dioxide Equivalent (CO_2e) Emissions Resulting from Fuel Consumption for Chemicals Handling

This table shows the carbon dioxide, methane, and nitrous oxide emissions generated from the handling (transport) of chemicals, which are required for odor control and treatment based on estimated demands of the alternatives at buildout. The chemicals include sodium hypochlorite, sodium hydroxide, thickening polymer, dewatering polymer, alum, filter polymer, and methanol.

The existing system does not require the use of chemicals and therefore does not generate CO_2e emissions in this category. In general, the alternatives are generating nearly the same amounts of CO_2e emissions.

DIRECT EMISSIONS

Recall *direct emissions*, consistent with the CCAR protocol, are those resulting from sources owned or controlled by the agency, such as stationary combustion sources, mobile combustion sources, and treatment unit processes. For this inventory, this includes treatment unit process emissions (e.g. septic tank venting).

Table 9. Carbon Dioxide Equivalent (CO_2e) Emissions Venting directly from Septic Tanks

This table shows the methane emissions generated (and vented) from the anaerobic digestion of settled solids within the septic tanks for the existing and STEP collection system alternatives. Remember that methane has a GWP 21 times that of carbon dioxide. The existing system generates the largest amount of methane annually due to the high concentration of BOD in the septic tanks.

Exhibit 2K

STATE OF CALIFORNIA

Arnold Schwarzenegger, *Governor*

NATIVE AMERICAN HERITAGE COMMISSION
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-4082
(916) 657-5390 - Fax

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FEB - 2 2009

COUNTY OF SAN LUIS OBISPO
DEPARTMENT OF PUBLIC WORKS

January 29, 2009

Mark Hutchinson
County of San Luis Obispo, Department of Public Works
1050 Monterey, County Govt. Center, Room 207
San Luis Obispo, CA 93408

RE: SCH#2007121034 Los Osos Wastewater Project (LOWWP); San Luis Obispo County.

Dear Mr. Hutchinson:

The Native American Heritage Commission (NAHC) has reviewed the Notice of Completion (NOC) referenced above. The California Environmental Quality Act (CEQA) states that any project that causes a substantial adverse change in the significance of an historical resource, which includes archeological resources, is a significant effect requiring the preparation of an EIR (CEQA Guidelines 15064(b)). To comply with this provision the lead agency is required to assess whether the project will have an adverse impact on historical resources within the area of project effect (APE), and if so to mitigate that effect. To adequately assess and mitigate project-related impacts to archaeological resources, the NAHC recommends the following actions:

- ✓ Contact the appropriate regional archaeological Information Center for a record search. The record search will determine:
  - If a part or all of the area of project effect (APE) has been previously surveyed for cultural resources.
  - If any known cultural resources have already been recorded on or adjacent to the APE.
  - If the probability is low, moderate, or high that cultural resources are located in the APE.
  - If a survey is required to determine whether previously unrecorded cultural resources are present.
- ✓ If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.
  - The final report containing site forms, site significance, and mitigation measurers should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum, and not be made available for pubic disclosure.
  - The final written report should be submitted within 3 months after work has been completed to the appropriate regional archaeological Information Center.
- ✓ Contact the Native American Heritage Commission for:
  - A Sacred Lands File Check. **USGS 7.5 minute quadrangle name, township, range and section required.**
  - A list of appropriate Native American contacts for consultation concerning the project site and to assist in the mitigation measures. **Native American Contacts List attached.**
- ✓ Lack of surface evidence of archeological resources does not preclude their subsurface existence.
  - Lead agencies should include in their mitigation plan provisions for the identification and evaluation of accidentally discovered archeological resources, per California Environmental Quality Act (CEQA) §15064.5(f). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American, with knowledge in cultural resources, should monitor all ground-disturbing activities.
  - Lead agencies should include in their mitigation plan provisions for the disposition of recovered artifacts, in consultation with culturally affiliated Native Americans.
  - Lead agencies should include provisions for discovery of Native American human remains in their mitigation plan. Health and Safety Code §7050.5, CEQA §15064.5(e), and Public Resources Code §5097.98 mandates the process to be followed in the event of an accidental discovery of any human remains in a location other than a dedicated cemetery.

Sincerely,

Katy Sanchez

Katy Sanchez
Program Analyst

CC: State Clearinghouse

Native American Contact
San Luis Obispo County
January 29, 2009

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Salinan

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for the proposed SCH# 2007121034 Los Osos Wastewater Project (LOWWP); San Luis Obispo County.

Native American Contact
San Luis Obispo County
January 29, 2009

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Native American Contact
San Luis Obispo County
January 29, 2009

Matthew Darian Goldman
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Chumash

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Chumash

Santa Ynez Band of Mission Indians
Sam Cohen, Tribal Administrator
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Salinan

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661-864-1295
408-966-8807 - cell

Salinan
Chumash

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This list is only applicable for contacting local Native Americans with regard to cultural resources for the proposed SCH# 2007121034 Los Osos Wastewater Project (LOWWP); San Luis Obispo County.

Exhibit 2L

County of San Luis Obispo

NOTICE OF DETERMINATION

Pursuant to the
California Environmental Quality Act

(ENDORSED)
FILED
SEP 3 0 2009
JULIE RODEWALD, COUNTY CLERK
By S.K. RAMOS
DEPUTY CLERK

To: County Clerk
County of San Luis Obispo
1055 Monterey Street, Suite D120
San Luis Obispo, CA 93408

From: Mark Hutchinson
Environmental Programs Manager
San Luis Obispo County Department of Public Works

Subject: Filing of Notice of Determination in Compliance with Section 21108 or 21152 of the Public Resources Code

Project Title: **Los Osos Wastewater Project, Final Environmental Impact Report (WBS 300337)**

State Clearinghouse Number: SCH# 2007121034

Lead Agency: County of San Luis Obispo
County Department of Public Works
County Government Center
San Luis Obispo, CA 93408

Lead Agency Contact Person: Mark Hutchinson **Telephone:** (805)781-5252

Project Location: In and east of the community of Los Osos, located at the south end of Morro Bay, twelve miles west of the City of San Luis Obispo,in San Luis Obispo County

Project Description: Construction and operation of the Los Osos Wastewater Project; including a collection system; wastewater treatment plant; effluent reuse and disposal systems consisting of environmental restoration, urban reuse, and agricultural reuse; solids treatment and disposal systems; and a community water conservation program.

ACTION BY THE (BOARD OF SUPERVISORS):

On September 29, 2009, the San Luis Obispo County Board of Supervisors certified the Final Environmental Impact Report for the Los Osos Wastewater Project.

This is to advise that the Board of Supervisors of the County of San Luis Obispo as Lead Agency has approved the above-described project on September 29, 2009, and has made the following determination regarding the above-described project:

1. The project will have a significant effect on the environment.
2. An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures were made a condition of the approval of the project.
4. A Statement of Overriding Considerations was adopted for this project
5. Findings were made pursuant to the provisions of CEQA.

The EIR with comments and responses and record of project approval may be examined at:

County Clerk's Office
County of San Luis Obispo
1055 Monterey Street
San Luis Obispo, CA 93408

County Planning & Building Department
County Government Center, Rm. 310
San Luis Obispo, CA 93408

Date received for filing at OPR:

Exhibit 2M

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JD

JUN 18 2010

COUNTY OF SAN LUIS OBISPO
DEPARTMENT OF PUBLIC WORKS

THE TRIBUNE Newspaper of the Central Coast

3825 South Higuera • Post Office Box 112 • San Luis Obispo, California 93406-0112 • (805) 781-7800

In The Superior Court of The State of California
In and for the County of San Luis Obispo
AFFIDAVIT OF PUBLICATION

AD #735136
SAN LUIS OBISPO COUNTY
PUBLIC WORKS

STATE OF CALIFORNIA
ss.
County of San Luis Obispo

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen and not interested in the above entitled matter; I am now, and at all times embraced in the publication herein mentioned was, the principal clerk of the printers and publishers of THE TRIBUNE, a newspaper of general Circulation, printed and published daily at the City of San Luis Obispo in the above named county and state; that notice at which the annexed clippings is a true copy, was published in the above-named newspaper and not in any supplement thereof – on the following dates to wit; JUNE 15, 16, 17, 2010 that said newspaper was duly and regularly ascertained and established a newspaper of general circulation by Decree entered in the Superior Court of San Luis Obispo County, State of California, on June 9, 1952, Case #19139 under the Government Code of the State of California.

I certify (or declare) under the penalty of perjury that the foregoing is true and correct.

Janet E. Durant

(Signature of Principal Clerk)
DATED: JUNE 17, 2010
AD COST: $1,790.46

Combined Final Notice of Potential Conversion of Floodplain, Adverse Effects to Cultural Resources and Notice of a Finding of No Significant Impact (FONSI)

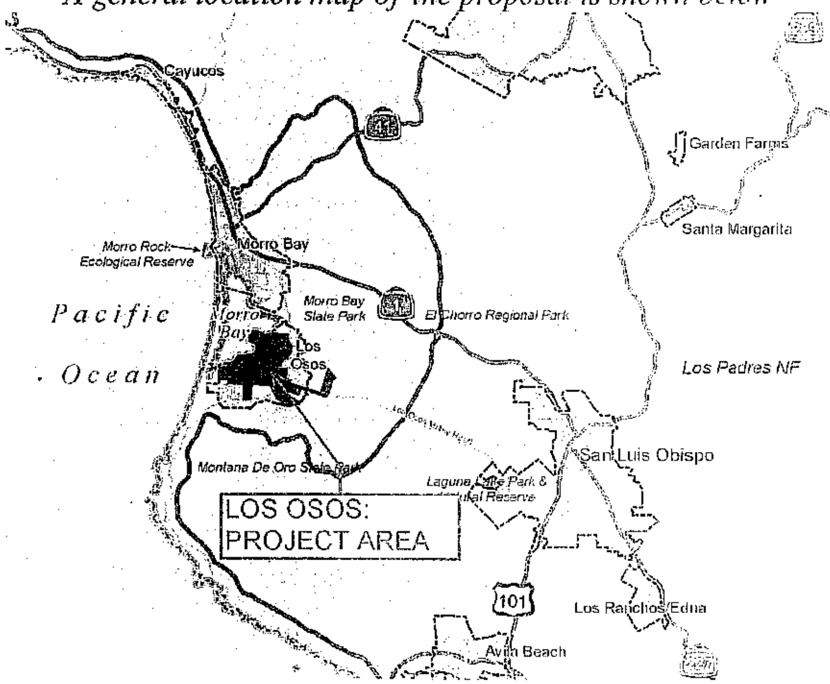
The USDA, Rural Utilities Service has received an application for financial assistance from the County of San Luis Obispo. The proposed project consists of the construction and operation of a wastewater collection, treatment, and disposal system to serve a portion of the community of Los Osos, CA. Rural Development has assessed the environmental impacts of this proposed project and determined that the location of construction activity and facilities will convert or affect the floodplain and cultural resources. It has been determined that there is no practicable alternative to avoiding this conversion.

As required by the National Environmental Policy Act, the Rural Utilities Service has assessed the potential environmental effects of the proposed project and has determined that the proposal will not have a significant effect on the human environment and for which an Environment Impact Statement will not be prepared. In order to avoid or minimize any adverse environmental impacts, the Rural Utilities Service will require the applicant to incorporate mitigation measures into the proposed project's design to address cultural resources, biological resources, and air quality.

The basis of this determination is the review of all environmental information including any comments from the public and regulatory agencies.

Copies of the Environmental Assessment can be reviewed or obtained at USDA Rural Development, 3530 W. Orchard Ct., Visalia, CA 93277, (559) 734-8732; or at the San Luis Obispo County Public Works Department, Country Government Center, Room 207, San Luis Obispo, CA, 93408, (805) 781-5252. For further information, please contact the offices listed above.

A general location map of the proposal is shown below



June 15,16,17, 2010 735136

Exhibit 3A

ARROYO GRANDE CREEK CHANNEL WATERWAY MANAGEMENT PROGRAM

FINAL REPORT

prepared for

for San Luis Obispo County Flood Control and Water Conservation District Zones 1 and 1A Flood Control District

prepared by

John Dvorsky, Principal Scientist

WATERWAYS CONSULTING, INC.

October 2010

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Appendices

1.0 PURPOSE, CONTEXT, AND GOALS

1.1 Purpose of the Arroyo Grande Creek Channel Waterway Management Program

The Arroyo Grande Creek Channel Waterway Management Program (WMP) is a comprehensive set of actions designed to restore the capacity of the leveed lower three miles of Arroyo Grande Creek Channel and the Los Berros Creek Diversion Channel (Figure 1) to provide flood protection up to a 20-year storm event while simultaneously enhancing water quality and sensitive species habitat within the managed channel. The WMP establishes a framework for how the lower portion of Arroyo Grande and Los Berros Creeks will be managed, long-term, to meet the goals established by Zones 1 and 1A (Zone 1/1A) of the San Luis Obispo County Flood Control and Water Conservation District (District) (Figure 1).

Management, within the context of the WMP, includes a combination of capital improvement projects, long-term maintenance activities, active restoration and enhancement projects, mitigation measures, performance monitoring, monitoring of implemented projects, programmatic elements, and adaptive management that responds to the performance monitoring activities. A description of each of these management activities are included in the WMP with enough detail so that the WMP will act as a guiding document on how to implement the project or program, how the project or program's success will be monitored, and what mitigation or protection measures will be required as part of project or program implementation. It is the hope of the District that this program is viewed as self-mitigating and the document is a useful tool that will allow regulatory agencies to issue multi-year permits for the efficient implementation of the program components.

1.2 Waterway Management Program Project Elements

The WMP was developed subsequent to an alternatives analysis that evaluated options to reduce flooding, manage sediment, and improve habitat conditions in the Arroyo Grande Creek Channel. The program alternatives were developed in cooperation with the community, the Coastal San Luis Resource Conservation District (RCD) and the District and are described in detail in the Arroyo Grande Creek Erosion, Sedimentation, and Flooding Alternatives Study (Alternatives Study) completed in January 2006 by Swanson Hydrology and Geomorphology. Alternatives 3a and 3c are the preferred alternatives and are the basis of the proposed Waterway Management Program. Alternative 3 includes the following key project elements:

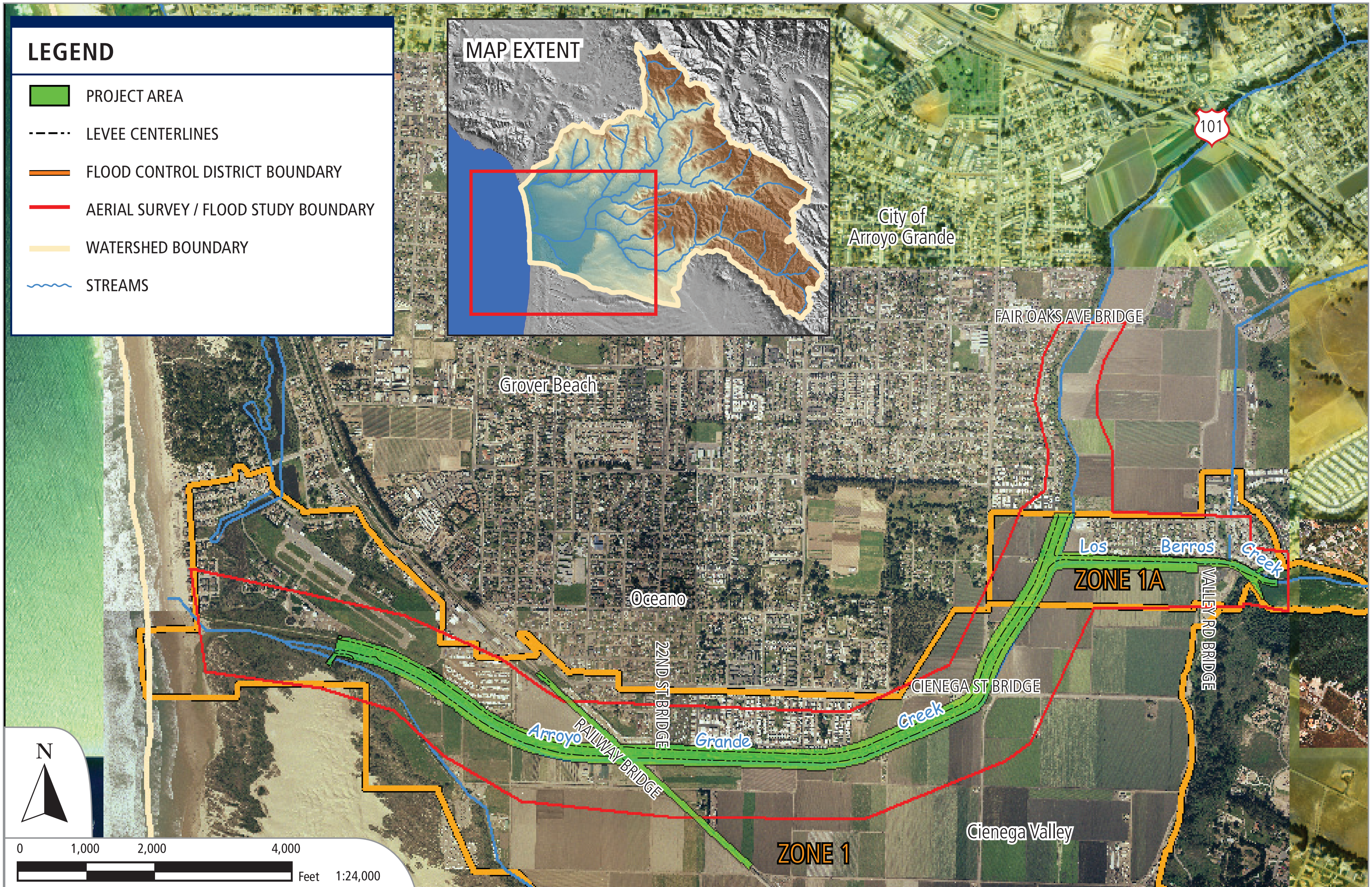

FIGURE 1: General location map for the project and study areas on Arroyo Grande Creek. The hydrology and sediment loads are dominated by tributaries such as Los Berros

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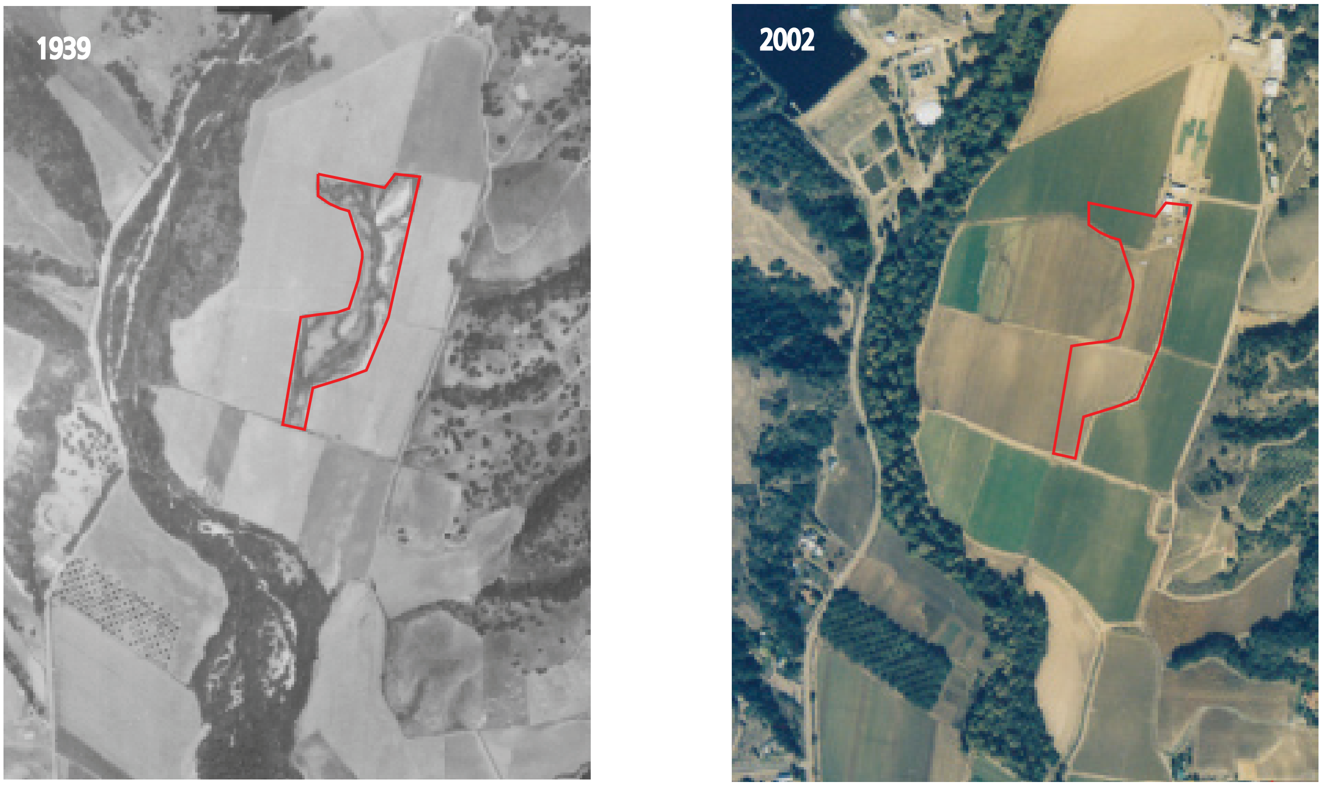
- ***Vegetation Management:*** Manage riparian vegetation annually to improve flood capacity. Within the riparian corridor support a continuous canopy cover of mature trees and fill existing gaps while encouraging species diversity.
- ***Sediment Management***: Conduct sediment management in a way that will improve flood capacity and enhance geomorphic function so as to minimize future sediment accumulations that require intensive management;
- ***Levee Raise:*** Raise levees throughout the flood control channel to ultimately achieve a channel capacity that will protect the adjacent community and farmland up to a 20-year flood event; and
- ***Raise UPRR Bridge:*** Raise the Union Pacific Railroad Bridge above the 20-year water surface elevation to increase the flood capacity of the channel.

1.3 Project Background

Arroyo Grande Creek has a long history of flood impacts to agriculture and human habitation that dates back to the time of the early settlements in the mid-19th century. Historical accounts and a geomorphic analysis of the lower watershed and Cienega Valley suggest that much of the valley floor was at grade with the Creek and consisted of a broad thicket of willows and other riparian trees (Dvorsky, 2004). From the time of the earliest settlements, use of the valley for homesteading, agricultural production, dairies, and cattle ranching required clearing of vegetation and active management of the channel and floodplain (Figure 2). Management, in those days, consisting primarily of ditching the channel to provide a predictable flow path, building levees, removing willow thickets, and leveling the land. Much of these activities were carried out by individual landowners with little to no coordinated efforts between adjacent property owners.

In the 1950's, severe flooding from Arroyo Grande Creek resulted in inundation of prime farmland in the Cienega Valley and significant impacts to existing infrastructure. At the time, Arroyo Grande and adjacent communities were primarily rural with a combined population of less than 5,000 residents. To reduce future economic impacts to the agricultural economy and the growing urban and rural residential population, the community organized the Arroyo Grande Creek Flood Control Project (Project). The Project, led jointly by the USDA-Soil Conservation Service/Arroyo Grande Resource Conservation District, was completed in 1961 to protect homes and farmland in La Cienega Valley. (These organizations are now known as the USDA-Natural Resources Conservation Service and the Coastal San Luis RCD, respectively.)



A: Remnant riparian area evident in 1939 aerial photo, (highlighted in red), no longer exists in 2002 aerial photo.

B: Wide floodplain / riparian area evident in 1939 aerial photo, in 2002 aerial photo riparian area is confined by agricultural fields.

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FIGURE 2: A) 1939 and 2003 comparison of aerial photos showing remnant floodplain and channel features. B) 1939 and 2002 comparison of aerial photos showing changes to riparian width.

The main feature of the Project was a levee system and trapezoidal channel that confined Arroyo Grande Creek from its confluence with Los Berros Creek downstream to the Pacific Ocean (Photo 1). In addition, the lower portion of Los Berros Creek from the Valley Rd Bridge to the confluence with Arroyo Grande Creek was diverted from its pre-1960 channel, which ran along the southern edge of La Cienega Valley, to its current confluence upstream of the Highway 1 Bridge. Runoff from the Meadow Creek watershed, which runs though Pismo Lake, was designed to enter Arroyo Grande Creek through a pair of flap gates, known as the Sand Canyon Flap Gates, near the Pismo State Beach. Maintenance of the Project, following construction was the responsibility of the District (Zone 1/1A), RCD, and NRCS per a maintenance agreement. Landowners within the zone are assessed an annual fee to support management and maintenance of the flood control reach.

Photo 1. Constructed trapezoidal channel at UPRR bridge in 1958.

The original flood control channel was built in 1959 and was designed to carry a discharge of 10,120 cubic feet per second (cfs), which, at the time of the analysis, was determined to have a recurrence of once every 100 years. Maintenance of the flood control channel as required by the 1959 Operation and Maintenance Agreement between the District, NRCS, and the CSLRCD (1959 Agreement), consisted primarily of vegetation and sediment removal to maintain the design geometry and capacity of the channel and routine maintenance of the levee system and associated infrastructure. Maintenance activities in recent years were restricted by a combination of lack of funding (Zone 1/1A maintenance funds had not risen appreciably since the creation of the special district) and environmental concerns about the impacts of vegetation and sediment removal on aquatic and riparian habitat in the flood control reach.

Environmental concerns and restrictions increased following the listing of the California red-legged frog (*Rana aurora draytonii*), in 1996, and steelhead (*Oncorhynchus mykiss*), in 1997. Protection of critical habitat for these two species meant that past maintenance activities, required under the 1959 Agreement with the NRCS and RCD, were no longer feasible. Limited sediment management did occur in November 1999 and October 2001 but pursuit of subsequent sediment management projects ended when the District pursued a permit in 2002 and it was determined that a Coastal Development Permit (CDP) was required. Although the Coastal Commission issued a CDP, they required preparation of a comprehensive analysis of the alternatives available for long-term flood protection, to be completed in three years. The District felt that development of a comprehensive plan would require more time and the 2002 CDP was withdrawn.

The requirements put forth by the Coastal Commission led the U.S. Fish and Wildlife Service, NOAA Fisheries, and the California Department of Fish and Game to also request that a more comprehensive strategy be prepared to manage the flood control reach through a maintenance program that specifically protects aquatic habitat. The 1959 Agreement was terminated by all parties on December 1, 2009. The termination of the agreement recognizes that the original project has reached its design life (50 years) and achieved its intended purpose. Parties to the agreement concur that major changes in watershed regulations, hydrology and objectives for the watershed require a new watershed plan not consistent with the 1959 maintenance agreement.

In 1999, the US Army Corps of Engineers developed a study to assess the existing capacity of the flood control reach. The results suggested that the system currently has a reduced capacity of 1,700 cfs which equates to a recurrence interval of approximately 2-year to 5-years (USACE, 2001). The capacity of the as-built channel (the channel as built in 1961), according to the USACE model, was determined to be 6,500 cfs with an associated level of protection between the 10-year and 20-year runoff event. These results showed that even with 1961 geometry, where sediment has been removed, the capacity of the channel has been reduced by approximately 1,000 cfs, most likely due to changes in the levee geometry from settlement and erosion. The USACE study pointed to the need for a more detailed alternative assessment to define project opportunities and costs associated with improving overall capacity and flood protection.

On March 5, 2001, during a high intensity rain event, the levee was breached on the south side between the mouth and the Union Pacific railroad bridge (Photos 2 and 3). It was estimated by observers in the field at the time of the levee breach that the levee would have overtopped upstream of the 22nd Street bridge had the levee not breached and lowered the overall water surface. Hundreds of acres of farmland and several residences were flooded in La Cienega Valley. Impacts from the flooding persisted beyond the winter season as many of the lower lying areas with clay soils located in the southern portion of the valley remained saturated. The northern levee remained intact, thereby protecting several residential developments, the Oceano Aiport, and the regional wastewater treatment plant that services the communities of Arroyo Grande, Oceano and Grover Beach.

Photo 2. Oblique photo of flooding in the Cienega Valley following the levee breach of March 2001 (looking south).

Photo 3. Close-up view of the levee breach and flooding of farmland in March 2001 (looking at south levee from north levee).

As a result and subsequent to the 2001 flooding, the RCD, on behalf of the District, contracted with the consulting firm of Swanson Hydrology and Geomorphology (SH+G) to develop a range of flood protection alternatives, known as the Alternatives Study, which was completed in January 2006. The Alternatives Study focused in-depth on erosion sources, sedimentation and hydrology as they relate to recurring flooding in the lower reaches of the creek. The final study described six different "Alternatives", or sets of feasible projects and management actions, that could be implemented to manage flooding in Zone 1/1A, and provides estimates of the degree of flood protection afforded by each Alternative. The Zone 1/1A Task Force, a technical subcommittee of the Zone 1/1A Advisory Committee, met with SH+G staff twice during 2005 to provide feedback and recommendations regarding which options to consider for analysis in the Alternatives Study, and to review preliminary results. The Zone 1/1A Task Force consisted of representatives from U.S. Fish and Wildlife, California Department of Fish and Game, the Coastal Conservancy, NOAA/NMFS, Regional Water Quality Control Board, San Luis Obispo County Public Works and Environmental Planning Departments, City of Arroyo Grande, Oceano Community Services District, Central Coast Salmon Enhancement, Zone 1/1A Advisory Committee, and U.S. Army Corps of Engineers.

The completion of the Alternatives Study provided Zone 1/1A with a range of viable solutions to improve flood capacity in the channel(s). The Zone 1/1A Advisory Committee endorsed Alternative 3 as the preferred alternative and in 2006 the property owners in Zone 1/1A approved additional property tax assessments to substantially enhance maintenance and operation efforts to the Arroyo Grande and Los Berros Creek Channels. Funding was now available to develop and carry out a long-term management plan for the flood control channel. In fall 2007, SLO County Public Works drafted a Notice of Preparation and a Request for Qualifications for preparation of an environmental impact report/environmental assessment and assistance with regulatory permitting. Representatives of the Zone 1/1A Advisory Committee Task Force joined SLO County Public Works staff in reviewing applications, conducting interviews, and selecting a consulting firm to recommend to the SLO County Board of Supervisors for contract. The firm selected was the Morro Group, now SWCA, Inc., partnering with SH+G (now Waterways Consulting) to prepare a Waterway Management Program (WMP) that includes project actions described under Alternative 3 of the Alternatives Study combined with enhancement actions that improve habitat conditions in the flood control reach for steelhead, California red-legged frog, and other species that rely on the aquatic environment.

In addition to activities specifically addressed in the WMP relating to the Arroyo Grande Creek channel, a Memorandum of Understanding (MOU) is in place that is designed to improve watershed conditions and limit sediment delivery from upslope areas to impacted reaches Arroyo Grande Creek such as the flood control reach. The County of San Luis Obispo and the County Flood Control and Water

Conservation District became a signatory to the Arroyo Grande Creek Watershed MOU on April 22, 2008. The purpose of the MOU is to enhance an overall understanding of watershed issues and promote consensus between the parties in order to better protect, manage and enhance the Arroyo Grande Creek watershed.

The MOU recognizes that some of the agencies have existing responsibilities within the watershed and that those autonomous responsibilities will continue. The intent of the MOU involves educating each other on those efforts and identifying how collaborative efforts in the watershed management can be implemented in the future more efficiently and effectively. Future implementation of collaborative efforts will require development of cost sharing agreements and action plans, which will need separate approval by participating agencies.

By signing the MOU, the County showed its support for collaborative watershed management. Other signatories of the MOU include: the City of Arroyo Grande, RCD, and the Central Coast Salmon Enhancement. The RCD and the Central Coast Salmon Enhancement have become key advocates for the MOU and are working with other resource agencies to become signatories, including: US Fish and Wildlife Service, Natural Resource Conservation Service, CA Department of Fish and Game, and CA Department of Parks and Recreation. The CA Regional Water Quality Control Board was solicited for signature, but was unable to sign and instead endorsed the MOU.

1.4 Project Need

The proposed project is needed to provide the residents of Zone 1/1A with improved flood protection. Prior to the termination of the 1959 maintenance agreement, the District, RCD, and NRCS were responsible for operation and maintenance of the leveed lower three miles of Arroyo Grande Creek. As concerns for environmental protection have increased, the District has been limited in its ability to conduct periodic maintenance to reduce flood risks to adjacent landowners and sustain the channel's design capacity. Consequently, the existing channel has a severely reduced capacity and can only provide protection up to the 4.6 year flow recurrence event. This level of flood protection is inadequate and severely limits the ability of Zone 1/1A to meet its obligations to residents in the District. This was evidenced during the 2001 levee system breach on the south side which inundated hundreds of acres of farmland and several residences. It could have been much worse if the system breached on the north side. However, the northern levee remained intact, thereby protecting several residential developments, the Oceano Airport, and the South County Sanitation District Wastewater Treatment Plant that services the communities of Arroyo Grande, Oceano, and Grover Beach.

2.0 EXISTING CONDITIONS

2.1 Project area

Arroyo Grande Creek is a 157 square mile coastal watershed located in west-central San Luis Obispo County (Figure 3). The mainstem of Arroyo Grande Creek flows through the cities of Arroyo Grande and Oceano and is an important regional waterway, providing agricultural and municipal water to the communities of Arroyo Grande, Grover Beach, Oceano, Pismo Beach, and Avila Beach by way of Lopez Reservoir located in the upper portion of the watershed. An expanding urban population and a desire to maintain the region's agricultural roots has resulted in an increasing demand on the natural and biological resources of the Arroyo Grande Creek watershed.

The Waterway Management Program project area is located along the lower portion of mainstem Arroyo Grande and Los Berros Creeks within San Luis Obispo County, California. The project area is a linear corridor with two segments: (1) beginning on Arroyo Grande Creek 0.14 mile upstream of the confluence of Los Berros Creek and continuing downstream to the upper edge of the Arroyo Grande Creek lagoon at the Pacific Ocean, and (2) beginning at the Century Lane Bridge on Los Berros Creek and continuing downstream to the confluence with Arroyo Grande Creek (Figure 1). The total project length is approximately 3.5 miles.

The project area ends just upstream of a euryhaline coastal lagoon that occurs at the mouth of Arroyo Grande Creek (Figure 4). Portions of the lagoon lie within the Pismo Dunes State Reserve and the lagoon bisects Pismo State Beach. Similar to other coastal lagoons in central California, the mouth of the creek is seasonally obstructed by a sand bar that forms in spring and persists until winter rains are sufficient to hydraulically force the sand bar to open. During drought or periods of prolonged dry weather the sand bar may not open at all. When the sand bar is in place depths in the lagoon can increase causing the lagoon to backwater a significant distance up into the flood control channel.

2.2 Larger watershed context

Though it is difficult to definitively describe what Arroyo Grande Creek may have historically looked like, historical accounts from early settlers and an understanding of the physical setting provides a glimpse into the past and a picture of how the channel functioned. A key feature in the existing landscape of Arroyo Grande is Lopez Dam. Lopez Dam is located at a point in the watershed where there is a

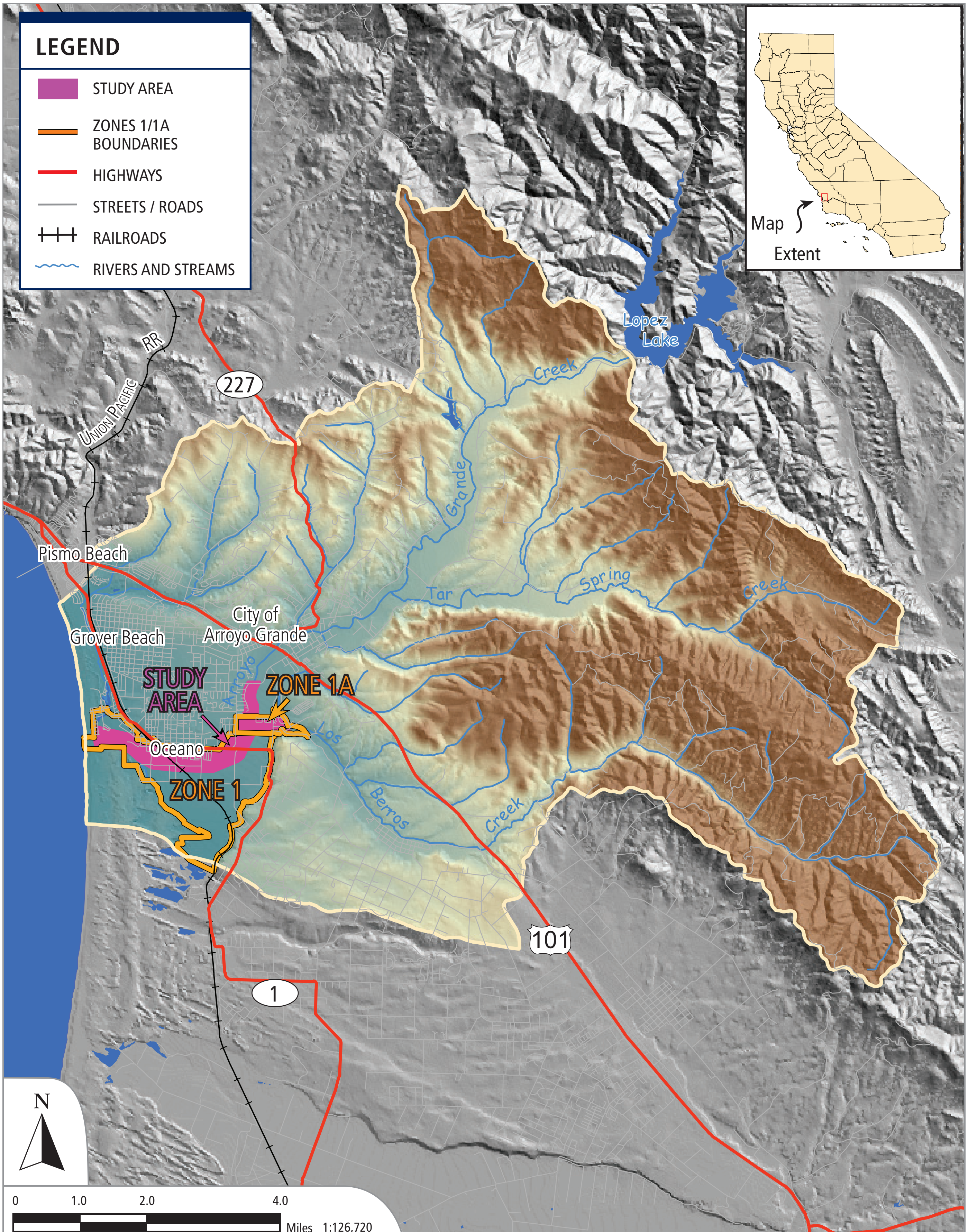

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FIGURE 3: Study area for the WMP. The WMP includes the levees, channel and riparian areas on lower Arroyo Grande Creek and lower Los Berros Creek within the Zone 1/1A Flood Control District.

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FIGURE 4: Lagoon and flapgate locations.

transition from confined mountain valley to an unconfined coastal plain. Dams are often sited in such a location because they provide a convenient constriction point for a dam, thereby minimizing the amount of earthen material required to impound a relatively large area upstream. Downstream of Lopez Dam the channel is much flatter, the valley much wider and historic floodplain deposits occur across the entire valley bottom (Figure 5). This area represents a depositional zone within the watershed where large quantities of water and sediment transported from the upper watershed historically spread across the valley floor, creating the large alluvial valley that exists today. Channels in steep, higher gradient valleys can transport more sediment than channels in lower gradient, wide valleys because the energy required to move sediment is a function of an energy gradient that is related to surface water slope and depth. This is often referred to as the sediment transport competence of the flow. In the lower portions of the mainstem, near the Community of Oceano, the floodplain deposits are extensive. Combined with the potential for a sand berm to form at the mouth, high tides and storm surges during peak flow events, and the constricting presence of the sand dunes, this portion of the system can be classified as deltaic in nature. The lower portion of the channel historically supported a large lagoon that extended into the Meadow Creek wetlands to the north of the existing levee.

2.3 Biological conditions

2.3.1 Botanical resources

Six plant community types occur within the Project Area including willow riparian woodland, riparian scrub, coyote brush scrub, ruderal (weedy) grassland, in-stream wetlands, and landscape tree groves. The willow riparian woodland habitat type comprises the majority of the proposed flood control area. In addition to the main plant community types, four special status species have been identified as having the potential to occur in the project area including sand marshwort, La Graciosa thistle, Gambels watercress, and San Bernardino aster. The potential for these species to occur is based on a records search of the California Native Plant Society (CNPS) and California Natural Diversity Database (CNDDB) inventories and the presence of suitable habitat on site.

When the flood control channel was constructed in 1959 all riparian vegetation was removed from the channel, resulting in a flat-bottom trapezoidal channel devoid of all vegetation. This condition was maintained for many decades with periodic dredging of the channel to maintain overall capacity. Due to concerns associated with the presence of threatened species, past management activities that maintained flood conveyance were restricted. Since 2006 vegetation is annually managed as part of a program conducted by the District with assistance from the RCD. The current program acquires annual permits from California Department of Fish and Game and the California Coastal Commission.

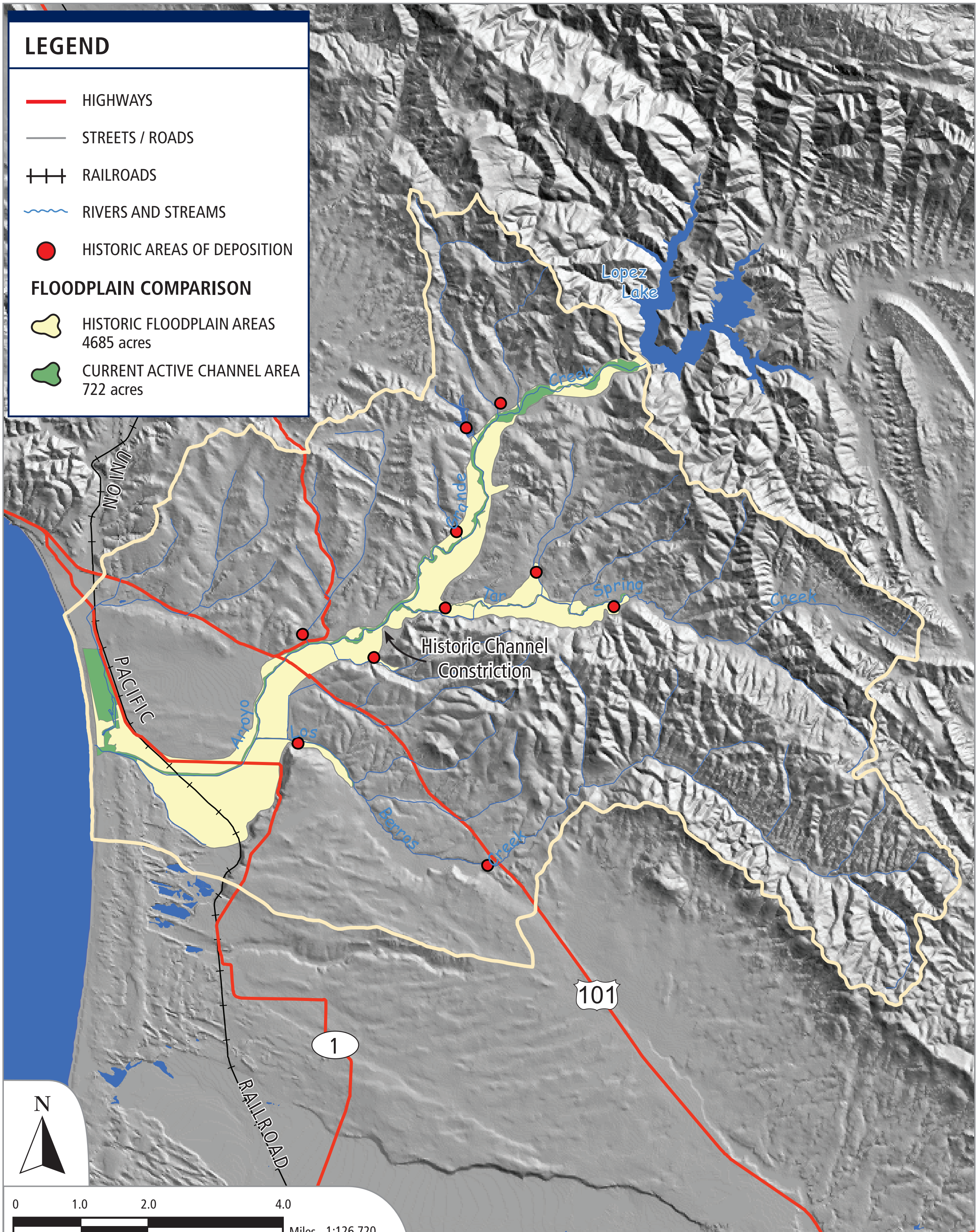

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FIGURE 5: Historic versus existing active channel areas on Arroyo Grande Creek and tributary channels downstream of Lopez Reservoir. Mapped surfaces represent areas of active deposition and storage of sediment delivered from the upper watershed. Loss of potential sediment storage in the lower valley results in transport and delivery of supplied sediment to the flood control reach.

2.3.2 Fisheries resources

Historically, Arroyo Grande Creek supported a large native population of steelhead (*Oncorhynchus mykiss*). Land use impacts in the watershed and construction of Lopez Dam and Reservoir has greatly reduced their numbers to a point where only a small run of adult steelhead occur today. Access to historic spawning habitat upstream of Lopez Reservoir was completely cut off due to construction of the dam in the late 1960's. The remaining habitat consists of the mainstem of Arroyo Grande Creek downstream of the dam and short reaches of year-round flow on tributaries such as Los Berros and Tar Springs. Unfortunately, the mainstem of Arroyo Grande Creek downstream of Lopez Reservoir, Los Berros Creek, and Tar Spring Creek do not provide the prime spawning and rearing habitat that historically occurred upstream of Lopez Reservoir. The accessible reaches of the mainstem of Arroyo Grande Creek consist of approximately 14 miles of channel along the mainstem, 14 miles of channel along Los Berros and an equal amount along Tar Springs.

In 1997, steelhead (*Oncorhynchus mykiss*) runs along the Central Coast of California were listed as threatened under the Endangered Species Act. Due to their declining numbers and federal protection, awareness has been raised about the fate of the steelhead run in Arroyo Grande Creek and a strategy is being pursued to restore this population through habitat enhancement measures downstream of Lopez Reservoir.

The most recent habitat assessment and steelhead abundance surveys were conducted in 2004 and 2006, respectively. Habitat assessments of the entire mainstem of Arroyo Grande Creek below Lopez Reservoir were conducted in the summer of 2004 by the California Conservation Corps (Close and Smith, 2004). Those data were then used to develop a random sample of discreet habitat units for a fish abundance survey conducted in the fall of 2006 (Dvorsky and Hagar, 2008). Within the Project Area a total of five discreet habitat units were sampled representing approximately 840 feet of channel. All of the habitat units were sampled via snorkeling and one of the habitat units was sampled via both snorkeling and electrofishing. The number of steelhead observed via snorkeling in all five habitat units sampled as part of the study was five. No steelhead were captured via electrofishing in the single habitat unit.

In the 2006 study, steelhead were markedly more abundant upstream of the flood control channel than within the flood control reach and then declined within the vicinity of Lopez Dam. In general low numbers of steelhead visually observed and sampled during the 2006 survey are consistent with previous studies on Arroyo Grande Creek which have suggested low steelhead adult returns, poor quality habitat, and impacts from loss of historic, high quality habitat present above Lopez Reservoir. The observations summarized in the 2008 report suggest that the best habitat present in the system occurs in the upper portions of Reach 2, Reach 3, and the lower portion of Reach 4 (Figure 6; Tables 1 and 2). Habitat conditions in the upper portions of Reaches 4, 5, 6, and 7 appear to be significantly influenced by a lack of high flows due to regulation by Lopez Reservoir. The lack of channel flushing flows has resulted in a narrow low-flow channel that lacks complexity (Close and Smith, 2004). In addition, much of the bed of the channel consists primarily of silt that likely limits spawning. The presence of excessive fine sediment loads in streams has been shown to limit macroinvertebrate production, reduce the amount of cover habitat available to juvenile salmonids, and limit successful spawning (Terhune, 1958; McNeil and Ahnell, 1964; Vaux, 1962; Cooper, 1965; Daykin, 1965). Portions of Reaches 2, 3, and 4 probably exhibit higher steelhead abundance because unregulated flows from Los Berros, Tar Springs, and Corbett/Carpenter Creeks allow for introduction of coarse material for spawning and flushing of fine sediment from pools and riffles.

In addition to steelhead a number of other species of fish occur in the system including Sacramento sucker, California roach, and threespine stickleback. Non-native fish species include bullhead, centrarchids, and mosquitofish.

Fisheries resources were evaluated in the lagoon from 2003 through 2006 (Rischbieter 2004; Rischbieter 2006; Rischbieter 2007). The purpose of the lagoon study was to understand fish use of the lagoon and evaluate the impacts that off-highway vehicles have on habitat quality and use. Off-highway vehicles are currently permitted to cross the mouth of Arroyo Grande Creek to gain access to the State Vehicular Recreation Area. In the 2006 study a total of 13 species of fish were collected from the lagoon including steelhead and tidewater goby. The highest densities of steelhead occurred in February 2006 with a decline in relative abundance through the summer and into fall of 2006.

2.3.3 Other Threatened & Endangered species

The California red-legged frog is a State Species of Special Concern and is Federally listed as threatened. This species is found in quiet pools along streams, in marshes, and ponds. Red-legged frogs are closely tied to aquatic environments, and favor intermittent streams which include some areas with water at least 0.7 meters deep, a largely intact emergent or shoreline vegetation, and a lack of introduced bullfrogs and non-native fishes. This species' breeding season spans January to April (Stebbins 1985). Females deposit large egg masses on submerged vegetation at or near the surface. Embryonic stages require a salinity of ≤4.5 parts per thousand (Jennings and Hayes 1994). They are generally found on

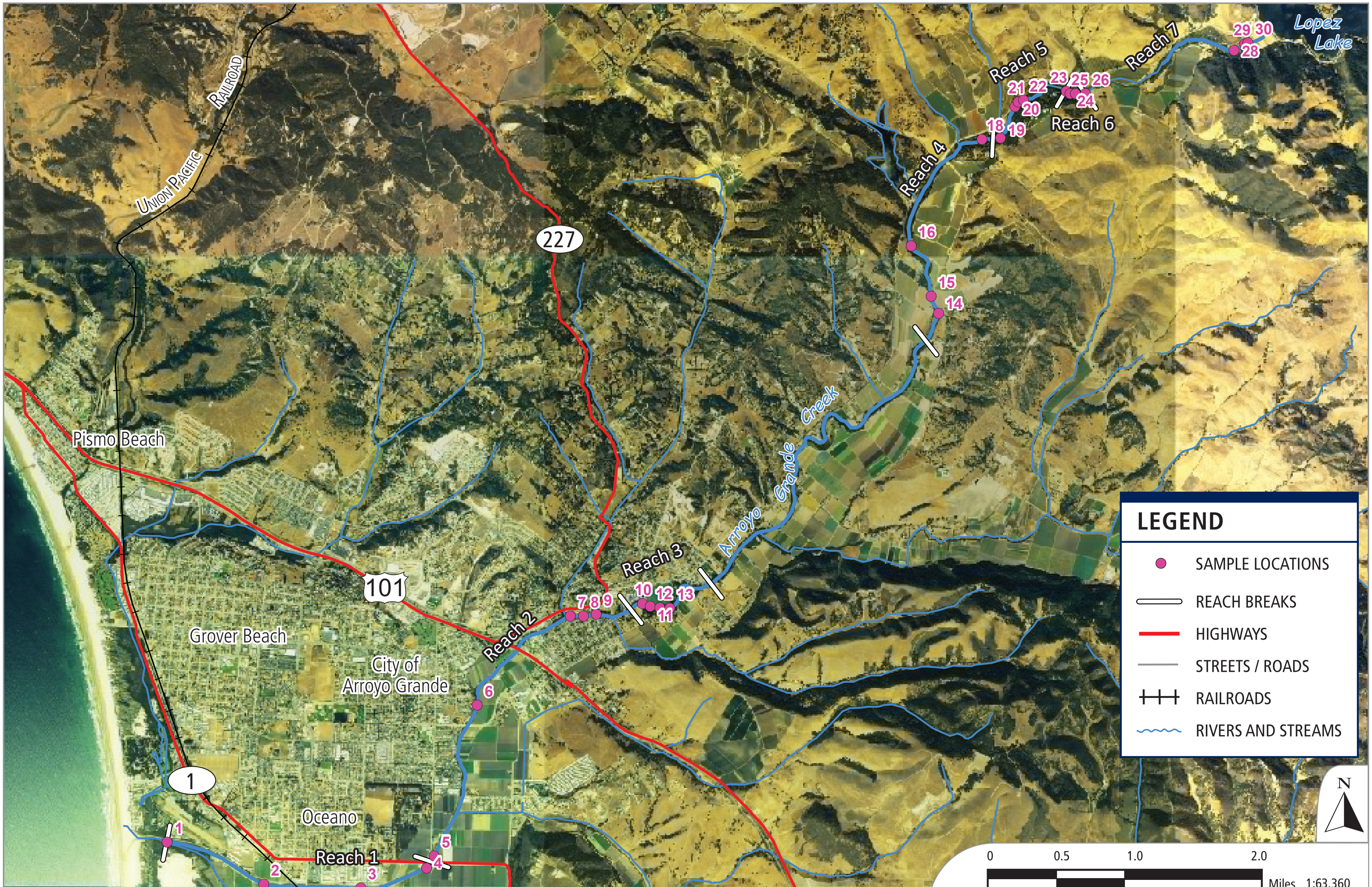

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FIGURE 6: Map indicating sample locations for the 2006 relative fish abundance study and geomorphic reaches along Arroyo Grande Creek.

Table 1

Reach	Sample Unit #	Steelhead	Sacramento Sucker	California Roach	Threespine Stickleback	Speckled Dace	Sculpin	Bullhead Catfish
1	3		19	15	12	1		
2	8	6	58	22		1	7	1
3	13	8	31	25	2	10		
4	14	3	10		1			
5	22	6	5		1			
6	23	4	12					1
7	28		13					

Table 2

Reach	Unit #	Electrofishing Total Catch	Snorkel Total Count
1	1		1
	2		1
	3	0	1
	4		2
2	5		0
	6		0
	7		21
	8	6	14
	9		15
3	10		28
	11		7
	12		12
	13	8	22
4	14	3	20
	15		6
	16		16
	18		3
5	19		1
	20		10
	21		2
	22	6	3
6	23	4	3
	24		1
	25		5
	26		0
7	28	0	4
	29		0
	30		9
	Grand Total	**27**	**207**

Note: Gray highlights denote habitat units that were electrofished and visually sampled.

TABLES 1 & 2: Table 1 - Fish species abundance as determined from electrofishing surveys in Arroyo Grande Creek, October 2006; Table 2 - Steelhead abundance in Arroyo Grande Creek based on electrofishing and visual surveys, October 2006.

streams having a small drainage area and low gradient (Hayes and Jennings 1988). Recent studies have shown that although only a small percentage of red-legged frogs from a pond population disperse, they are capable of moving distances of up to 2 miles (Bulger 1999). The red-legged frog occurs west of the Sierra Nevada-Cascade crest and in the Coast Ranges along the entire length of the state. Much of its habitat has undergone significant alterations in recent years, leading to extirpation of many populations. Other factors contributing to its decline include its former exploitation as food, water pollution, and predation and competition by the introduced bullfrog and green sunfish (Moyle 1973, Hayes and Jennings 1988).

California red-legged frogs have been observed within the flood control reach of Arroyo Grande Creek (Essex Environmental 2002; CSLRCD 2005). The flood control reach is expected to provide summer foraging habitat for the frog; however, due to swift winter flows through the study area, it is not likely to provide suitable frog breeding habitat. The lack of vegetation and dry summer conditions in the Los Berros Creek portion of the study area make it unsuitable for California red-legged frogs. The study area is not within the currently designated critical habitat for California red-legged frog (USFWS 2005).

2.4 Hydrologic and hydraulic conditions

Winter peak flow events on Arroyo Grande Creek can be characterized as flashy and are tied closely to the duration and magnitude of winter rainfall and antecedent soil moisture conditions. In most years, the rainy season begins in October, but the soil moisture demand of the surrounding areas is not met until a significant amount of precipitation has occurred. Once the ground is saturated, a greater percentage of the precipitation is converted to stream flow during storm runoff and the continual contribution of groundwater and subsurface flow to stream channels increases the winter baseflows. Precipitation is typically much lower during April, but the stream flows remain elevated as groundwater and subsurface flow continues to contribute water to the streams. By May, the water levels in the streams are typically low and relatively unresponsive to small spring thundershowers.

Historically, in lower Arroyo Grande Creek, summer baseflow was primarily maintained by releases from Lopez Reservoir. Summer releases from Lopez Reservoir were conducted to recharge the aquifer and meet the municipal water needs and those of the farming community. Currently, downstream releases are conducted on a daily basis throughout the year to ensure that environmental and agricultural needs are being met. This downstream release flow regimen is expected to change once the flood control district completes an on-going Habitat Conservation Plan (HCP). It is anticipated that the HCP will be completed within the next 2-3 years. Although it is rare due to the moderate coastal climate in the area and the presence of a summer marine layer, off-shore winds can result in unusually warm temperatures on the coastal plain. When these conditions occur, heavy pumping of the local aquifer for agricultural uses can result in temporary dewatering of portions of lower Arroyo Grande Creek.

In the 1950's, the AG Creek flood control channel was designed to handle a 100-year storm, then calculated to be 10,120 cubic feet per second (cfs). However, since construction of the flood control channel, additional data has been collected that better describes less frequent peak discharge events such as the 50-year and 100-year recurrence events. In addition, urbanization of the watershed has likely altered the timing, magnitude, and frequency of high flow events. Both the 1999 Army Corps of Engineers report and 2006 Alternatives Study now calculate the 100-year flood at more than 19,200 cfs, almost twice the 1950's estimate of 10,120 cfs (USACE 1999; SH+G 2006). More frequent events also have a higher discharge than what was calculated when the flood control channel was constructed. The modeling has also been improved allowing for more precise estimates of channel roughness and the influence of debris and sediment on the ability of a channel to convey water. Consequently, even if regulatory constraints were not present and the original cross-sectional area of the flood control channel was restored, the Project could not protect adjacent property owners during a 100-year event.

Most recent estimates of peak flow hydrology for the Arroyo Grande Creek channel were conducted in 1998-99 by the U.S. Army Corps of Engineers, Los Angeles District. These data show the effect of the dam on peak flow in lower Arroyo Grande Creek. Downstream of Lopez Dam, a 2-year event is only 25% of what it would be if the dam were not present. During a 100 year event it is approximately half. The opposite is true for summer baseflow conditions. Winter peak flows are stored in Lopez Reservoir for release in the dry summer months for groundwater recharge for municipal and agricultural uses. Historically, those releases have been managed to maximize recharge and minimize the amount of water that reaches the Pacific Ocean. Currently, additional releases are being made for environmental considerations as well. Therefore, higher base flows occur along lower Arroyo Grande Creek than under pre-dam conditions. The hydrologic record suggests that median summer baseflow conditions prior to construction of Lopez ranged between 1.5 to 2.5 cubic feet per second (cfs), as opposed to 3 to 4 cfs post-dam. During dry and drought years, the data suggest that the Creek would periodically dry up between July and October pre-dam but maintain flows between 0.5 and 2 cfs post-dam (Stetson, 2004).

3.0 PROJECT ELEMENTS

Following completion of the Alternatives Study, the Task Force that was directed to oversee completion of the study met to discuss the proposed project alternatives and to make a decision on how to move forward. The approach selected by the Task Force was to pursue a phased implementation of Alternative 3 as funding within the local flood control district became available and/or opportunities arose to pursue grant funding or long-term loans. Alternative 3, once completely implemented, would provide flood protection up to the modeled 20-year return period. Given limited funding on an annual basis, the need to fund the environmental review and regulatory permitting, and the ongoing vegetation management program, Alternative 3 would most likely be implemented in several phases to eventually provide the expected level of flood protection (Figure 7).

Alternative 3 includes the following components:

- Annual vegetation management;
- An initial phase of sediment removal with maintenance in subsequent years;
- Raising existing levees in two stages representing protection from 10-year and 20-year floods; and,
- Raising and/or retrofitting the Union Pacific Railroad Bridge that crosses Arroyo Grande Creek to improve conveyance and reduce flood risk.

3.1 Current Efforts

Currently, the District conducts annual vegetation management, but has not conducted any sediment removal since 2001. No sediment removal has been authorized due to environmental restrictions and requirements put forth by regulatory agencies that a more comprehensive strategy be prepared to manage the flood control reach (see section 1.3).

In 2006 the RCD received a permit on behalf of the District, from California Department of Fish and Game to begin a vegetation management program through the flood control reach from approximately the Union Pacific Bridge upstream to Los Berros Creek. The vegetation maintenance program generally followed the approach laid out in the Alternative Study, limbing up existing vegetation to encourage formation of a riparian canopy, removal of smaller stems and trunks to reduce cross-sectional

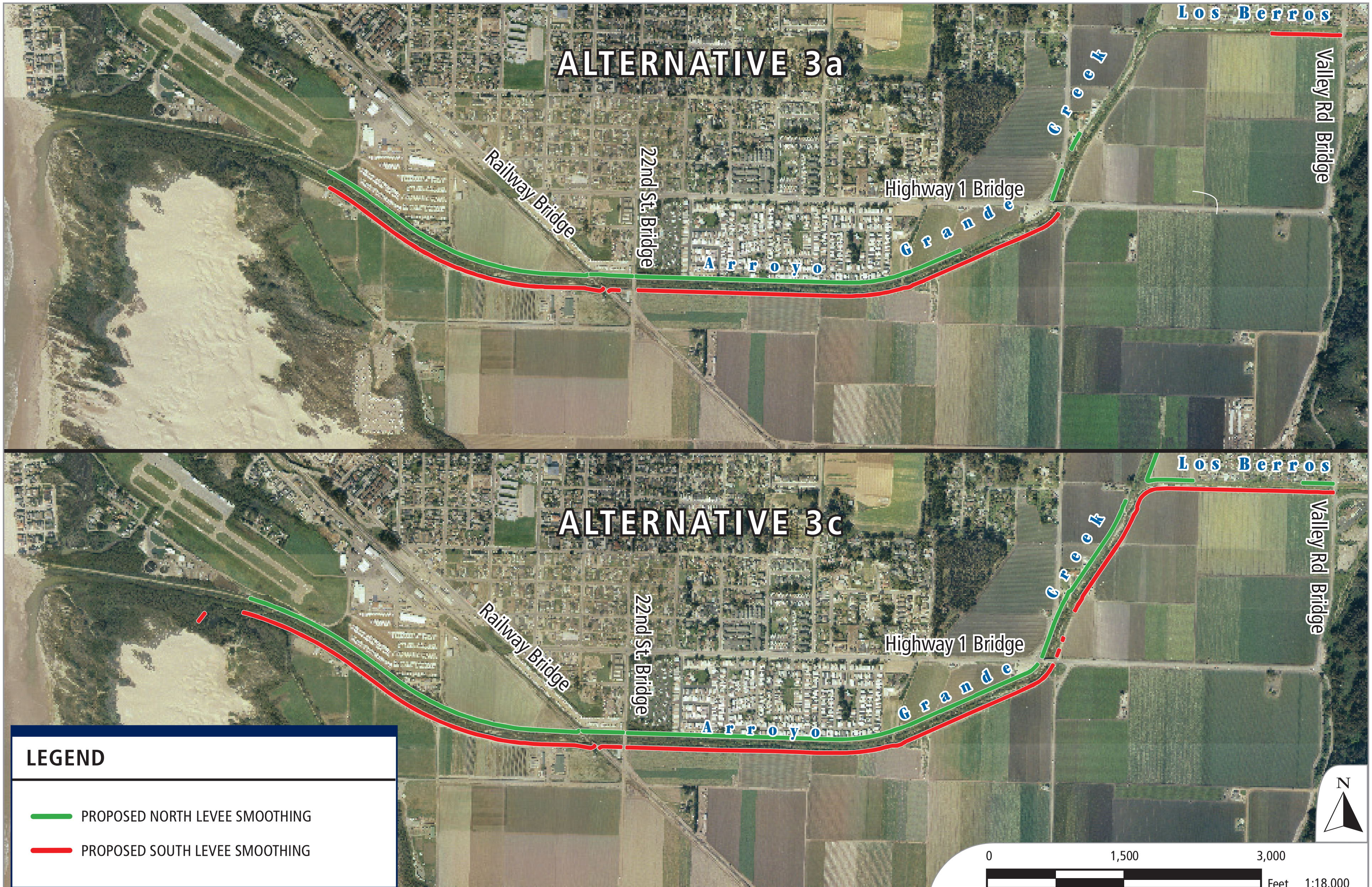

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FIGURE 7: Plan views of levee raise locations for Alternative 3a - Levee Smoothing (10-year protection), and Alternative 3c - Levee Raise (20-year protection). Under Alternative 3a, the north levee is raised approximately 4-inches above the south levee to provide additional protection to residential areas as compared to the south levee which is dominated by agricultural land uses. Under Alternative 3c, levee raising would occur along most of the flood control reach including the Los Berros channel.

roughness, and invasive removal. In 2007 the RCD received a permit, on behalf of the District, from the Coastal Commission to extend the vegetation management program within the Coastal Zone from the Union Pacific Railroad Bridge to just downstream of Guitton's Crossing. Vegetation management activities utilizing these principles has greatly improved the riparian canopy and complexity throughout the Arroyo Grande Creek Channel while at the same time providing increased flood protection. Improvements in the riparian canopy conditions are illustrated in Photos 4-9.

The long-term effectiveness of the existing vegetation management program, conducted by the District with assistance from the RCD, to reduce the potential for flooding on lower Arroyo Grande Creek is limited by the following factors:

1. The current vegetation management program is only permitted by short-term agreements with the California Department of Fish and Game and the California Coastal Commission. The program does not require a U.S. Army Corps of Engineers permit and therefore does not have incidental take statements issued by U.S. Fish and Wildlife and National Marine Fisheries Service that would protect the District from an enforcement action if ESA listed species were "taken" during annual maintenance activities. The current permits only allow for biological monitors to be present during maintenance activities and avoid areas where species, mainly California red-legged frog, are found. This has resulted in a lack of vegetation management along portions of the channel, creating segments where channel roughness is high relative to upstream and downstream segments and flood conveyance is low. Because overall flood conveyance is generally limited by the segment with the least conveyance, discontinuities in the vegetation management program have reduced flood conveyance along the entire flood control reach.
2. The current permit does not allow for complete removal of all woody vegetation outside the 10 foot buffer or any long-term program to manage sediment. The program proposed in the Alternatives Study was developed to protect the primary low flow channel and maintain a functional riparian corridor while providing improved flood protection by increasing conveyance. Outside the designated riparian corridor, secondary channels would be created and maintained for flood conveyance. Meeting the competing objectives of improving flood capacity and protecting aquatic and riparian resources required this compromise.

The need to address the reduced flood protection of the levee system due to sediment accumulation, the obstruction at the UPRR Bridge, and the limitations in the annual vegetation management program prompted the preparation of the WMP. The intent of the WMP is to define how lower Arroyo Grande and Los Berros Creek Channels will be managed to provide long-term reductions in flood risk and improved aquatic habitat conditions for key species of interest. The key components of the WMP

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PHOTOS 4,5,6: Times series of photographs looking upstream of 22nd St. Photos show recovery and improvement of the riparian corridor along the Arroyo Grande Creek Channel following sediment removal in 1999 and annual vegetation management activities after 2006.

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PHOTOS 7,8,9: Times series of photographs at UPRR bridge. Photos show recovery and improvement of the riparian corridor along the Arroyo Grande Creek Channel following sediment removal in 1999 and annual vegetation management activities after 2006.

include vegetation management, sediment management, two phases of levee raise, and replacement or modification of the Union Pacific Railroad Bridge.

3.2 Vegetation Management

For vegetation management activities, a differentiation is made between the Arroyo Grande Creek Channel and Los Berros Creek Channel. Because the relative size of these channels are completely different and the flood control channel reach of Los Berros lacks any appreciable flow in the summertime, vegetation management activities need to be different to reflect site conditions, opportunities, and constraints.

The vegetation management program for the Arroyo Grande Creek Channel will consist of maintaining a 10-foot buffer on both sides of the low-flow channel to provide riparian habitat and streamside cover to protect aquatic habitat (Figure 8). Where riparian vegetation exists on the Los Berros Creek Channel, a 5-foot buffer on each side of the active low flow channel will be maintained. Each buffer would be measured at breast height (i.e. - similar to the technique of measuring tree trunk diameters at breast height [DBH]) and does not necessarily represent the width of the riparian canopy. Depending upon the maturity of the trees, the upper portion of the tree canopy would likely extend well beyond the buffer width although the exact future width of the canopy would be unknown and would vary (Figure 9).

The buffer would also act to maintain a primary low-flow channel that has developed over the last several years by providing root strength along the low flow channel margins. Woody vegetation outside of the buffer would be removed completely to allow for high flows to access secondary channels (see sediment management program) and provide for increased conveyance and flood capacity. Non-woody herbaceous vegetation would not be removed as they are expected to lay down during a large flow event. Willows present within the buffer would be limbed up to reduce cross-sectional roughness but still provide adequate stream shading and riparian habitat.

Management activities within the buffer will consist of the following:

- Trees greater than 4” DBH on the banks of the active channel, from the toe of the active stream channel uphill to a distance of 10 feet from the channel (5 feet for Los Berros), will have horizontal branches trimmed to a height of not more than six feet from ground level. If creek shade is provided by adjacent larger trees, willow sprouts less than 4” DBH will be cut to within 6” of the ground. Trimming the trees on the banks in this manner will encourage growth

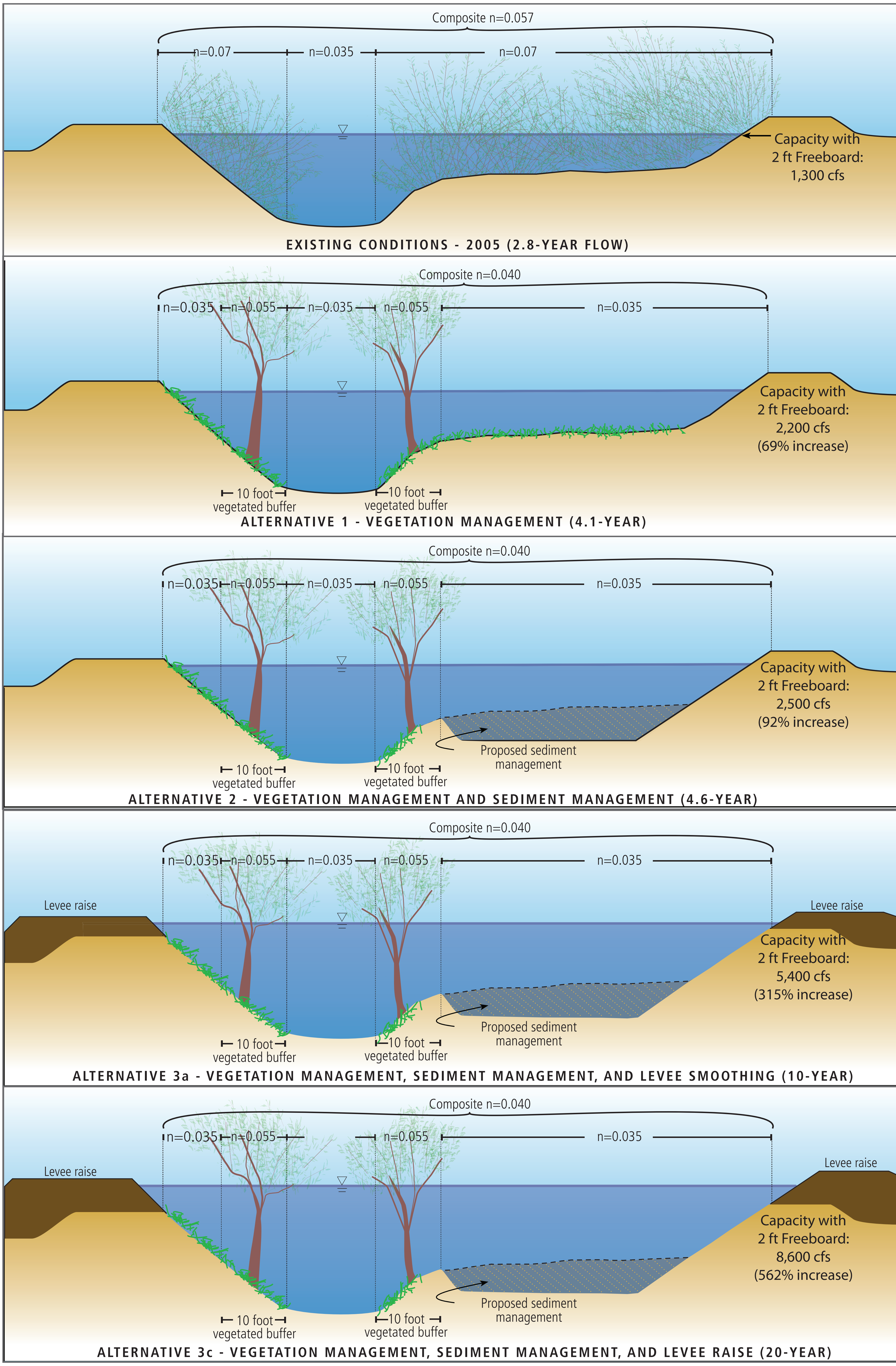

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FIGURE 8: Conceptual cross-section view.

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FIGURE 9: Typical view of vegetation maintenance activities.

in the upper canopy of the trees, improving their ability over time to shade the creek, while also improving channel capacity to handle high flows by lowering the roughness coefficient.

- No trees will be removed within the buffer area with the exception of trees that have fallen over and are a risk to the integrity of the levee (e.g. – lodged against levee or bridge) or have the potential to increase the risk of flooding (e.g. – have fallen across the channel and are obstructing flow). All root balls will be left intact to enable resprouting and to help stabilize soils.

All woody vegetation within the buffer occurring 50 feet upstream and 30 feet downstream of existing bridges will be removed completely.

- Vegetation management activities will be conducted by hand crews and will include the use of mechanized and non-mechanized hand equipment such as chainsaws, loppers, etc. No debris will be allowed to enter the stream channel and debris from invasive species will be separated, bagged and disposed of at a designated landfill. Native vegetation cut from the channel will be mulched on site and either used as mulch on the back side of the levees or removed to a designated off-site area.

To improve riparian habitat through the project area, existing gaps in the riparian buffer would be revegetated with native riparian species including cottonwood, sycamore, and willow, with the exception of the Los Berros portion of the project area. Los Berros Creek differs from Arroyo Grande Creek in that it is not a perennial channel therefore vegetation characteristics are different and it lacks a mature riparian corridor. Cottonwood, sycamore, and alder will be planted at random along the length of the Arroyo Grande Creek Channel to encourage long-term diversity in the riparian corridor. Vegetation management activities will be combined with an active program to remove non-native vegetation from the flood control channel. Non-native species to be actively removed include Himalayan blackberry, English ivy, fennel, weeping willow, giant reed, castor bean, poison hemlock, and geranium. Non-native species management activities could include use of goats, application of herbicides, or removal by hand of plant and rootball. Non-native vegetation removed from the channel will be bagged and disposed of accordingly to limit their spread.

Vegetation management would be conducted as often as necessary to maintain a composite roughness of 0.04 through an adaptive management approach that would include reconnaissance surveys and site visits with regulatory agency staff. Vegetation management activities would likely occur annually depending on the amount of re-growth and funding. Based on vegetation management activities that have occurred over the last four years, regrowth of managed vegetation during the spring and summer is heavy, requiring annual maintenance.

Vegetation management involving tree trimming would occur as late as possible in the summer and fall of each year to maximize stream shading during the warmer summer months and would only occur between July 1 and October 15 of any given year. If tree trimming activities occur prior to August 15 protocols to avoid impacts to nesting birds will be followed. Vigorous regrowth of willow is expected in late winter and spring providing low, overhanging vegetation during critical months for steelhead and red-legged frog rearing (Photo 10). In the Los Berros Creek Channel, since there are few trees but an overgrowth of non-native species, vegetation management to remove the invasive species would occur in early spring to prevent the vegetation from going to seed. If activities occur prior to July 1, protocols to avoid impacts to the low flow channel will be followed. These will include a start date no earlier than April 15 in the Los Berros Channel and activities will occur when the channel is dry and with agency authorization. Removing the invasive species prior to them going to seed will reduce vigorous regrowth during the following winter/spring and promote the growth of native species.

Photo 10. Spring/early summer regrowth of vegetation in the flood control channel just upstream of the 22nd St Bridge.

3.3 Sediment Management

The need for constant dredging of the flood control channel to maintain design capacity is primarily rooted in two geomorphic principles that dictate sediment delivery and transport in the flood control reach. They include:

1. Much of lower Arroyo Grande Creek downstream of Lopez Dam historically consisted of a broad floodplain characterized by an ephemeral active channel that migrated across the floodplain in response to sediment deposition and debris jams. The loss of that function has resulted in delivery of high sediment loads to the lower reaches of the watershed resulting in excessive sediment deposition in the flood control reach.
2. The original flood control channel design did not consider the concept of a “bankfull” channel when sizing bed dimensions. Bankfull can be defined as the stage that corresponds to the discharge at which channel maintenance is the most effective. It is at the bankfull discharge where, over time, the largest volume of sediment is moved and in-stream morphologic features, such as pools and riffles, are created.

Field observations in the flood control reach, following an extended period with no appreciable dredging, suggests that a bankfull or primary low-flow channel width of approximately 20-25 feet has developed along the Arroyo Grande Creek channel (bankfull was difficult to evaluate in areas backwatered by beaver dams). The flood control channel design created a bottom width of 60-70 feet, resulting in excessive sediment deposition because flow was spread out, resulting in shallower water depths and less energy to move sediment (shear stress, a measure of the water’s ability to do work, is a function of flow depth). Consequently, the geomorphic setting and design geometry are an important reason why there is a need to constantly remove sediment from the channel. Maintenance of a primary low-flow channel, enforced by the presence of a stable riparian corridor, will improve sediment transport conditions through the flood control reach.

To enhance geomorphic function, improve flood conveyance, and "set" the flood control channel to an initial condition that will enhance sediment transport, a two step process has been proposed for sediment management within the project area. The two step process consists of an initial phase of sediment removal that will be completed the first year, followed by a long-term sediment management program that will rely on periodic monitoring of sediment conditions in the channel and consultation with permitting agencies to "reset" conditions back to the first year condition.

The first year sediment removal program will include removal of sediment on the levee side of the riparian buffers (Figure 9). Where excessive sediment has built up in the designated off-channel areas, sediment would be removed to a depth of 1.5-foot above the thalweg elevation of the Arroyo Grande Creek Channel and 1-foot above the Los Berros Creek Channel, as measured at a riffle. These depths were estimated as the appropriate bankfull depth for these channels based on field indicators. Sediment that has accumulated as a bar feature along the buffers will not be removed, thereby encouraging higher velocity flows along the primary and secondary channels and enhancing sediment transport conditions.

Overflow or secondary channels will be excavated in designated off-channel areas to create overflow paths during high flow events. In natural systems, the primary channel contains low flows, whereas secondary channels become activated during higher flows that, on average, occur once a year (Figure 10). The Arroyo Grande Creek flood control channel currently lacks the secondary channels that are found in more natural, low gradient stream environments. Based on the current configuration of the primary (low flow) channel, secondary channels will crisscross the primary channel as the primary channel meanders between the levee side slopes (see Appendix B - Preliminary Engineering Design Plans).

During high flow events, the intersection of the primary and secondary channels are expected to be areas of complex flow conditions that will create localized eddies, backwaters, and scour. To take advantage of these high energy areas and encourage development of complex cover habitat for steelhead and red-legged frog, two types of large woody structures will be constructed at these locations (see Appendix B for details on the proposed log structures). One type of large wood structure will be placed at the downstream end of each secondary channel as it conflues with the primary channel. The structure will provide protection from any headcutting into the secondary channel and therefore enforce the location of the primary channel. The structure has also been designed to encourage pool scour at the confluence and mimic an undercut bank (similar to lunker structures traditionally used to enhance fish habitat). Because pool habitat and escape cover is lacking through the flood control reach, improvements to these physical habitat characteristics are expected to greatly improve aquatic habitat. In addition, these structures will provide escape cover for adults migrating through the reach to preferred spawning and rearing habitat areas that occur upstream of the flood control reach.

The second type of large wood structure would protect the head of bar that would exist at the downstream side of the confluence. This structure would also enforce maintenance of the primary and

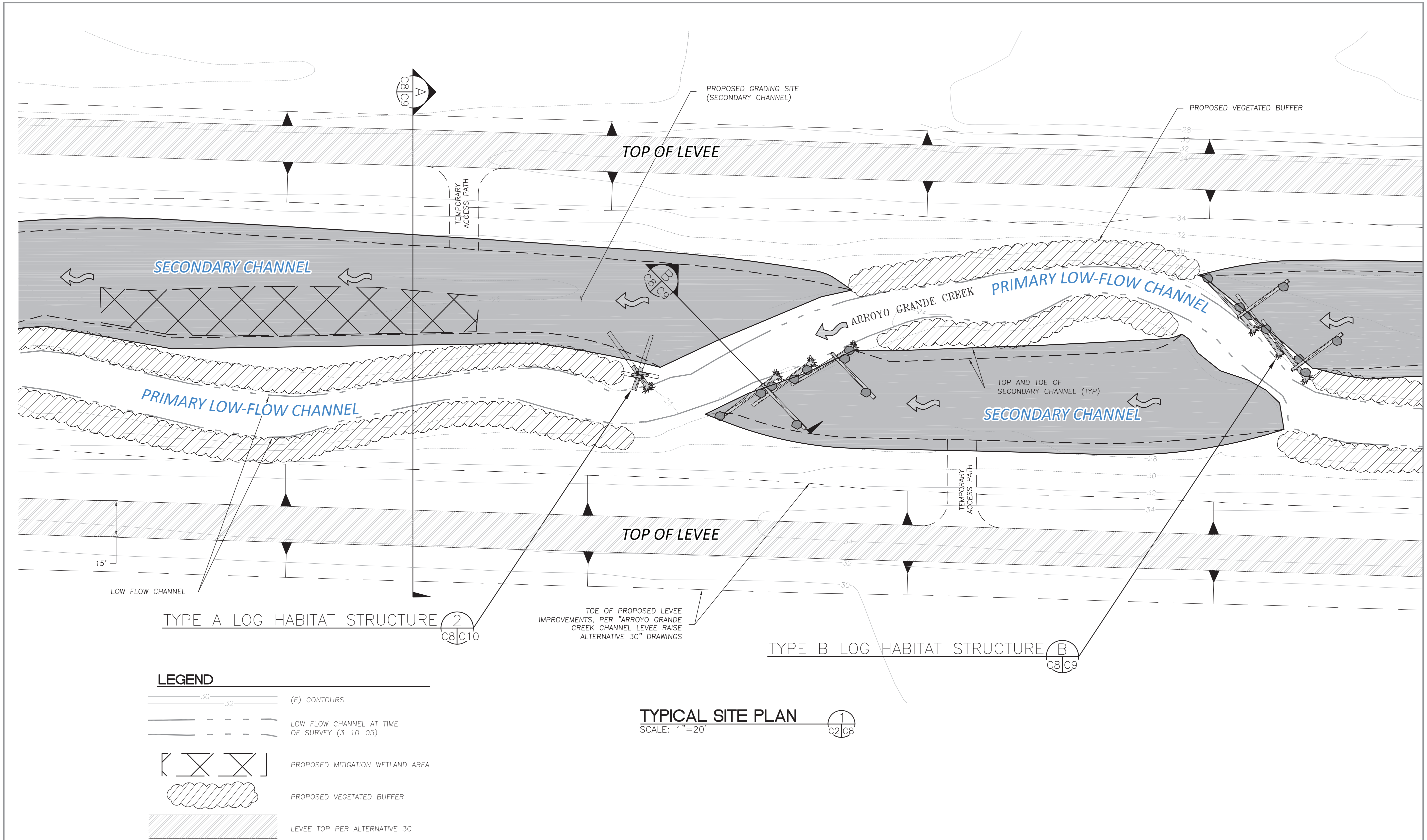

FIGURE 10
Conceptual sediment and vegetation management plans for the Arroyo Grande Creek Channel.

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secondary channel locations and create a hard point that would encourage turbulence and creation of a pool at the confluence of the channels. Although both types of structures are designed to meet different habitat and channel stability objectives, they will promote pool scour, encourage variability in substrate and flow field conditions, and provide deep pools and cover habitat for steelhead and red-legged frog.

Some maintenance of the secondary channels is expected over the long-term. Post first-year sediment management activities will likely consists of an excavator, located on the top of the levee, scooping and removing built up sediment. Removed sediment will be placed in a dump truck, also located at the top of the levee, to take the sediment off-site to a County approved area. Long-term sediment management activities are not expected to involve removal of vegetation or use of equipment within areas with flowing water.

Cross-sections will be monitored periodically to assess the performance of the channel in moving supplied sediment. Modeling presented in Chapter 4 of the Alternatives Study (SH+G, 2006) suggests that increased sediment transport conditions through the flood control reach will not negatively impact the Arroyo Grande Creek lagoon. To ensure that the depth of the lagoon is not impacted, additional cross-sections will be established at the lagoon and monitored following significant runoff events. Cross-sections will also be established along the flood control reach to provide information on the need to do spot removal of accumulated sediment to ensure that the project passes target flood flows. Annual maintenance will also be a component of the overall vegetation and sediment management program. A similar program has been successful on the San Lorenzo River in Santa Cruz County despite concerns about steelhead and Coho salmon (SH+G et al, 2002). In the case of the San Lorenzo River, secondary channels have developed a gravel/cobble surface due to scouring action and lack of fine sediment deposition. The objective of the annual maintenance program is to keep the secondary channels open for flood flows.

3.4 Raise Existing Levees

A key component of the Waterway Management Program involves raising the existing levees to improve flood protection along lower Arroyo Grande Creek. The levees would likely be raised in two phases to ultimately achieve flood protection up to a 20-year flood event. The first phase would raise the levees to an elevation that would provide 10-year flood protection. The second phase would achieve the desired 20-year flood protection. Both phases would incorporate sediment and vegetation management activities to achieve the desired level of flood protection. The levees would be raised along most of lower Los Berros Creek Channel and along Arroyo Grande Creek Channel from the Los Berros confluence to the upstream end of the lagoon (Figure 8). The existing levees will be raised with the inside slope of the levee at 2:1, the outside levee at a slope of 1.5:1 and top of levee width not less than 15 feet (see Appendix B - Engineering Design Plans for details on the proposed levee raise). All levee raising work would take place on the outside of the existing levee, where feasible, and not impinge upon the existing Ordinary High Water (OHW).

3.5 Union Pacific Railroad Bridge

The Union Pacific Railroad (UPRR) Bridge, located near the downstream end of the flood control reach, presents an obstruction to flow under current conditions (Photo 11). In addition, the bridge does not cross at a 90 degree angle to the flood control channel and the abutments do not run parallel to the flow path of Arroyo Grande Creek. Under the proposal to raise the adjacent levees to provide 20-year flood protection, the UPRR Bridge would need to be modified, raised, or replaced to enable the levee raise. The UPRR Bridge does not need to be modified for the smaller (10-year protection) levee raise project. Given funding issues, it is unclear when the bridge would be modified, raised, or replaced in relation to the proposed levee raise.

Photo 11. Union Pacific Railroad (UPRR) bridge during the 2001 flood.

Any plan to modify, raise, or replace the UPRR Bridge would require work within OHW and within the low flow active channel. A temporary shoo fly track would be constructed adjacent to the existing bridge to provide uninterrupted service along the UPRR line during construction activities. The project may require temporary dewatering activities during certain phases of the construction which would be accompanied by standard water quality and aquatic habitat protection measures. It is also likely that a small amount of riparian vegetation would need to be removed in the riparian buffer area (beyond the already proposed vegetation removal 50 feet upstream and 30 feet downstream of the bridge), necessitating revegetation efforts following construction.

4.0 MONITORING AND ADAPTIVE MANAGEMENT PLAN

4.1 Goals and objectives

Two key elements of the WMP, namely the vegetation and sediment management programs, will require activity within Arroyo Grande Creek over the long-term and in some cases on an annual basis. To maximize the benefit of these activities, reduce the costs to Zone 1/1A, and protect vital biological resources, long-term management will need to be adaptive to the conditions on site in any given year and will require a regulatory approach that is flexible within the objectives defined by the management program. An integral element of the management program is a well-defined monitoring program that provides the data necessary, in a timely manner, to effectively manage the system. This section outlines the proposed Mitigation and Monitoring Plan that will guide long-term vegetation and sediment management within the flood control reach.

4.2 Vegetation management

4.2.1 Goal

The goal of the vegetation management program is to maintain a balance between flood protection along lower Arroyo Grande Creek and protection of natural resources that rely on a healthy riparian corridor to protect important aquatic habitat. The vegetation management program, as outlined in Section 3.1 accomplishes these objectives in two ways:

1. Management of riparian vegetation to maintain a cross-sectional roughness of 0.04, and
2. Maintenance of a continuous corridor of riparian vegetation along the established primary (low flow) channel.

It is expected that vegetation management activities will occur on an annual basis, requiring a large crew working in the channel between April 15 and October 15. To ensure that vegetation management activities are carried out in a consistent manner, all workers will need to be properly trained and abide to the protection measures proposed in the WMP.

4.2.2 *Monitoring and Performance Measures*

Management of vegetation for flood control through the project reach has been conducted annually for the last three years and is expected to continue indefinitely on an annual basis. Because some of the work related to vegetation management is subjective and the level of effort may vary from year to year depending on growth rates, high flow conditions the previous year, and an inherent variability in year to year effort, annual monitoring will be required to direct management activities. The annual monitoring of vegetation conditions is meant to be a key component of an adaptive management strategy that seeks to respond to changing conditions, both from a flood control and natural resource perspective, based on defined performance measures. A summary of the performance measures and monitoring efforts associated with each is provided in Table 3 and are as follows:

- **PM VEG-1:** Finalize the annual vegetation management work plan by July 1. The draft work plan should be submitted for review and comment by the regulatory agencies by May 1 with comments provided by the regulatory agencies by June 1. The final work plan should be in place by July 1 for implementation. If invasive removal is needed, a final work plan just for invasive removal shall be in place by May 1. The work plan will address Performance Measures 2 through 4.
    - **MON VEG-1:** Each year in late spring, a report will be prepared defining the proposed vegetation management work plan to be conducted in the summer and early fall. The work plan will incorporate field notes and maps to define the management actions that will be carried out each year. Issues addressed in the work plan will include proposed areas of revegetation based on mapped gaps in riparian vegetation, locations and densities for focused plantings of non-willow species, areas and species type of non-native removal efforts, and depictions of areas where woody vegetation needs to be removed outside the riparian buffers. The work plan should be detailed and specific enough to provide a year-to-year road map to the group tasked with conducting the proposed activities. Where feasible, woody vegetation outside of the buffer recommended for removal should be flagged to allow independent review by regulatory agency staff.
- **PM VEG-2:** Increase riparian canopy cover. The primary objective of maintaining a riparian buffer is to create a continuous riparian canopy through the project area that provides benefit to terrestrial and aquatic species that rely on cover habitat, cool water temperatures, and other functions provided by a continuous and diverse riparian corridor. The objective of this performance measure would be to maintain or increase riparian canopy cover through the project area.

Activity	Performance Measure	Monitoring Element	Current Status of Parameter	Performance Target	Frequency
Vegetation Management	**PM VEG-1**: Finalize Work Plan	**MON VEG-1**: Prepare vegetation management work plan	Not Applicable	Annual work plan finalized by July 1[1]. Work plan will address PM VEG 2-4.	Annually following adoption of the WMP
	PM VEG-2: Increase riparian canopy cover	**MON VEG-2**: Measure canopy cover through project reach	To be measured following adoption of the WMP and Year 1 vegetation management to establish a baseline	Maintain or increase % canopy cover above baseline conditions.	Every three years following adoption of the WMP
	PM VEG-3: Increase riparian species diversity	**MON VEG-3**: Measure canopy species diversity through project reach	To be estimated following adoption of the WMP and Year 1 vegetation management to establish a baseline	County will consult with agency staff to determine targets based on success of diversity efforts over first 10 years of management	Every three years following adoption of the WMP
	PM VEG-4: Eliminate invasive species	**MON VEG-4**: Map invasive vegetation that occurs within project reach	Invasive species populations not currently mapped. Would be mapped prior to initial vegetation management activities.	1. Provide map of invasive species populations prior to Year 1 vegetation management	Update invasive species map every three years following adoption of the WMP
				2. No net increase of invasive species populations after Year 2015.	
Sediment Management	**PM SED-1**: Finalize Work Plan	**MON SED-1**: Prepare sediment management work plan	Not Applicable	Work plan finalized by September 1 of year prior to sediment management activities. Work plan will address PM SED 2-5.	As needed according to cross-section and hydraulic modeling results
	PM SED-2: Aggradation does not cause loss of 2-foot levee freeboard	**MON SED-2**: Cross-section monitoring through project reach	Not Applicable	Modeling results show that freeboard still exists above expected level of protection.	As needed according to reconnaissance assessment of sedimentation through flood control reach
	PM SED-3: Project does not result in long-term aggradation of lagoon	**MON SED-3**: Cross-section monitoring of lagoon	Baseline will be surveyed prior to first-year sediment management activities	Lagoon sedimentation patterns are within the range of natural variation.	Every three years following adoption of the WMP
	PM SED-4: Improve cover habitat for salmonids	**MON SED-4**: Evaluate habitat conditions in the project reach (Flosi et al)	Baseline to be established from CCC survey conducted in 2004.	Maintain or increase the cover rating for the project area as compared to baseline.	Every three years following adoption of the WMP
	PM SED-5: Improve maximum pool depth		Baseline to be established from CCC survey conducted in 2004.	Maintain or increase the average maximum pool depth in project area as compared to baseline.	Every three years following adoption of the WMP

1 - If invasive removal is proposed on Los Berros prior to June 15, that portion of the annual Work Plan will need to be finalized by May 1.

TABLE 3

Summary of the performance measures and monitoring efforts.

- **MON VEG-2:** Measure canopy cover every three years and report the percent cover in the annual Vegetation Management Workplan. The area of measurement shall include that between the centerlines of the north and south levees and the east and west project boundaries, as shown in Figure 1.

- **PM VEG-3:** Increase riparian species richness and density in the project area. Candidate species include but are not limited to sycamore, alder, and cottonwood. A performance target will be adapted as necessary during annual consultation with regulatory agencies.
  - **MON VEG-3:** Preparation of the first Vegetation Management Workplan shall include (1) a description of the number and approximate diameter at breast height (DBH) of the existing candidate species within the project area and (2) a planting plan for candidate species. Each subsequent annual workplan shall include an update of the number of individual candidate species, the DBH, and a planting/maintenance plan, as applicable.
- **PM VEG-4:** Achieve a riparian corridor that is free of invasive non-native species. Non-native invasive species are prevalent throughout the project reach although they have not been mapped. Consequently, a baseline will need to be established in the summer of 2010 and an eradication strategy will need to be developed and discussed in the annual work plan. The performance target would be to conduct most of the eradication efforts prior to 2015 with no net increase in infected areas beyond 2015. Key species to eradicate would be Arundo, ivy, Himalayan blackberry, and castor bean. Removal techniques may include application of herbicide, removal by hand of plant and rootballs, or the use of goats.
  - **MON VEG-4:** Map the presence of significant areas of non-native invasive species within the project area.

4.3 Sediment management

4.3.1 Goal

The goal of sediment management activities is to increase and maintain flood capacity through the project reach while at the same time improving instream aquatic habitat and reducing the need for maintenance dredging in the future. These goals will be achieved through an initial dredging of previously built up sediment to create secondary channels and integration of habitat enhancement structures consisting of large wood. Sediment management activities, including Year 1 and future activities, incorporate Best Management practices, monitoring activities, and performance measures that are well tested and have proven to be important as part of an overall strategy to adaptively manage channel conditions.

4.3.2 Monitoring and Performance measures

Monitoring of the sediment management portion of the project is directly related to the performance of the elements of the sediment management plan. Secondary channels are being proposed to enhance sediment transport through the reach and reduce the frequency of dredging activities. Concerns were also raised about the impact sediment management activities in the flood control reach will have on sediment transport into and through the lagoon.

Performance measures for the sediment management portion of the project are focused on preparation of the work plan and assessing the quality of instream aquatic habitat and how aquatic habitat function changes over time in response to sediment management activities. Aquatic habitat conditions were last surveyed in 2004 and relative fish abundance sampled in 2006. These studies would act as a baseline to evaluate the benefits of the proposed sediment management activities moving forward. The results from these studies suggest that the Arroyo Grande Creek Channel is primarily used by steelhead adults as a migratory corridor and marginally as rearing habitat for juveniles. Monitoring and performance measures summarized in Table 3 and included below address these concerns through a monitoring program that directly responds to management actions that address sediment reduction and habitat enhancement activities.

- **PM SED-1:** Finalize a work plan for sediment management activities by September 1 of year prior to when activities are expected to occur. The work plan should be submitted for review and comment by the regulatory agencies by August 1 with comments provided by the regulatory agencies by August 15. The work plan will address Performance Measures 2 through 5.
    - **MON SED-1:** Prepare, review and finalize work plan for sediment management.
- **PM SED-2:** Sedimentation in the project area does not reduce capacity in any one location beyond the defined freeboard.
    - **MON SED-2:** Cross-section monitoring will be conducted periodically in the flood control reach to determine if sediment accumulation in the secondary channels has reduced conveyance to the extent where additional sediment management is required. Cross-section monitoring data will be used in conjunction with the hydraulic model to determine if the levee freeboard has been compromised. Freeboard has been defined as 2-feet under all modeled alternatives in the Alternatives Study. For example, under the action that only includes vegetation and sediment management, the flood control channel is expected to provide protection up to the 4.6 year event with 2 feet of freeboard. In any given year, if the cross-section data and modeling results show that a

4.6 year event cannot be contained without the freeboard, Zone 1/1A would prepare a sediment management plan, based on the cross-section monitoring data, to remove sediment from the secondary channels to achieve 4.6 year flood protection with 2 feet of freeboard. Cross-section monitoring and preparation of a sediment management work plan would consist of the following:

1. Permanent cross-section locations will be established and monumented along the project reach following Year 1 sediment management activities. Cross-sections will be established every 500 feet along the channel and at the upstream and downstream sides of each of the bridges.
2. All of the established cross-sections will be measured Year 1 and roughness will be estimated for each to establish a baseline. A report will be produced and a database established.
3. Periodically, at the discretion of the District, Zone 1/1A, a portion of the cross-sections will be re-surveyed to evaluate the degree of sedimentation. The cross-sections surveyed in any given year will be incorporated into the hydraulic model along with the roughness estimates and a determination will be made regarding the need for dredging of any secondary channels.
4. Re-surveying of established cross-sections should occur as early as possible following the cessation of winter rains (i.e. – April/May). A report cataloging the results of the survey will be used to determine if a sediment management plan is necessary.
5. If sediment management is required, a sediment management plan will be prepared outlining where sediment management is needed, what quantity of sediment will be removed, when the activity will occur, and what equipment and approach will be used. The sediment management plan will be submitted to the agencies for review and comment.
6. If a sediment management plan is prepared, it should be submitted for comment to the agencies by August 1 of the year prior to any proposed dredging activities. Agency comments shall be received by August 15 following submittal of the sediment management plan.

- **PM SED-3:** Sediment management activities in the project area do not result in long-term aggradation in the lagoon and loss of lagoon volume. Evaluation of this performance measure will require a survey of the lagoon prior to the first year of sediment management activities to establish a baseline condition. The performance goal will be to not reduce the lagoon volume by more than 25% from the baseline based on a six year moving average of measured conditions.

- **MON SED-3:** To evaluate potential long-term sediment impacts on the lagoon from sediment management activities in the flood control reach, cross-sections will be established in the lagoon.
  1. A total of four cross-sections will be established, approximately equally spaced throughout the lagoon. The cross-sections will be established in 2010 to develop a baseline and to understand year-to-year natural variability in lagoon morphology prior to initiation of long-term sediment management activities.
  2. The four cross-sections will be monitored every 3 years following the first year sediment management activities and a report will be prepared.
  3. If after 9 years sediment management shows no effect on the lagoon, then cross-sections monitoring will be reduced, following discussions with regulatory agencies.

- **PM SED-4:** Increase or maintain the cover rating through the project reach. Cover habitat is important for rearing juvenile steelhead, especially with the known presence of non-native predatory species, as well as providing refuge areas for adult steelhead during high flow conditions. A baseline of the cover rating will need to be established for the project area. The last comprehensive habitat survey of the project area was in 2004 by the CCC's. Depending upon the timing of first year sediment management activities additional surveys may be required to establish baseline conditions.
  - **MON SED-4:** To evaluate changes in aquatic habitat conditions along the Arroyo Grande Creek Channel, habitat assessments will be conducted through the project reach every three years using protocols established in the California Salmonid Stream Habitat Restoration Manual (Flosi et al, 1998). The habitat assessment will repeat the work conducted by the California Conservation Corps in 2004 or a later survey if it is determined to represent a better baseline condition. The assessment work will be conducted in late summer/early fall of each monitoring year with a report prepared and submitted by December 1. The report should also include recommendations for adaptive management.
- **PM SED-5:** Increase or maintain average maximum pool depth through the project reach. Deep pool habitat is important for steelhead and is currently lacking in the project reach. Most of the pools are shallow, bordering on glide habitat with little to no complexity. A long-term goal of the project would be to improve local scour to enhance pool formation. A baseline of average maximum pool depth will need to be established for the project area. The last comprehensive

habitat survey of the project area was in 2004 by the CCC's. Depending upon the timing of first year sediment management activities additional surveys may be required to establish baseline conditions.

- **MON SED-5:** Same as MON SED-4.

4.4 Protection measures

The following measures have been proposed to protect natural resources within the project area during all proposed activities included within the WMP:

- **PM-1:** RLF are assumed to occur throughout the AG Creek flood control channel during the season that vegetation management activities are likely to happen. To protect RLF, the following protection measures must be adhered to:
    1. To allow for the potential disturbance of habitat or the necessary temporary relocation of RLF during maintenance and/or construction activities, take protection for RLF must be obtained as part of the 404 process with U.S. Army Corps of Engineers. This process will require consultation with U.S. Fish and Wildlife Service who will issue a Biological Opinion for the project. The Biological Opinion may contain protection measures in addition to those outlined in this section that must be adhered to.
    2. A Service-approved biologist will survey the project site no more than 48 hours before the onset of work activities. Given the length of time that vegetation management activities are likely to occur, daily surveys may need to occur that precede work in any particular section of the channel. If any life stage of the California red-legged frog is found and these individuals are likely to be killed or injured by work activities, the approved biologist will be allowed sufficient time to move them from the site before work activities begin. The Service-approved biologist will relocate the California red-legged frogs the shortest distance possible to a location that contains suitable habitat and will not be affected by activities associated with the proposed project. The Service-approved biologist will maintain detailed records of any individuals that are moved (e.g., size, coloration, any distinguishing features, photographs (digital preferred) to assist him or her in determining whether translocated animals are returning to the original point of capture.
    3. Before any management or construction activities begin, a Service-approved biologist will conduct a "worker awareness" training session for all personnel involved in the

activity. At a minimum, the training will include a description of the ecology of the California red-legged frog and its habitat, its protected status, and the specific measures being implemented for this project to avoid harm to and conserve the California red-legged frog for the current project, and the boundaries within which the project may be accomplished. Brochures, books and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions.

4. During maintenance or construction activities, if a RLF is observed within an area where activities are occurring, all activities will cease and qualified biologist will be contacted. Activities can not resume until the qualified biologist has either temporarily relocated the RLF or the amphibian has been identified as another species.
5. Weed whackers will NOT be used by maintenance crews so as to reduce the risk of harming RLF.
6. A monitoring report and completion form will be prepared by the qualified biologist and sent to the Ventura Fish and Wildlife Office following completion of the activity.

- **PM-2:** For any work performed between February 15 and August 15, a qualified biologist will conduct the necessary surveys for nesting birds. If active nests are identified, work in those particular areas will be delayed until after August 15 or the biologist has determined the young have fledged.
- **PM-3:** When feasible, all work activity occurring within the active low flow channel shall be conducted when the channel is dry or at its lowest flow condition (late summer).
- **PM-4:** If management or construction activities require the temporary dewatering and relocation of fish, these activities will utilize gravity flow and will be constructed, operated, and removed according to the following conservation measures:
    - Where diversions are appropriate, they will be constructed independently for each project element, or group of project elements, so as to minimize the duration that any particular segment of stream channel is dewatered.

- **PM-5:** Dewatering activities may require the temporary relocation of fish. To protect fish resources the following measures will be adhered to in order to minimize potential steelhead mortality during relocation activities:
    1. Block nets will be placed at the upper and lower extent of the diversions or coffer dams to ensure that salmonids upstream and downstream do not enter the areas proposed

for dewatering. Block nets will not be removed until installation of all cofferdams, bypass pipes or channels, diversion dams or other facilities designed to dewater or divert flow, are completed.

2. If electrofishing techniques are utilized during fish relocation activities, at least one member of the field crew will be familiar with NMFS electrofishing guidelines and have a minimum of 100 hours of field experience with electrofishing techniques.
3. Electrofishing may not be performed if water temperatures exceed 18^{o} Celsius, or could reasonably be expected to rise above this temperature during the activities.
4. Electrofishing shall not be utilized in areas where water conductivity is greater than 350 uS/cm. Only direct current (DC) shall be used. At least one assistant shall aid the biologist during electrofishing by netting stunned fish and other aquatic vertebrates.
5. Each electrofishing session must start with all equipment settings (voltage, pulse width, and pulse rate) set to the minimums needed to capture fish. These settings should be gradually increased only to the point where fish are immobilized and captured, and not allowed to exceed the specified maxima: Voltage = 100V (Initial) – 400V (Max); Pulse width= 500 uS (Initial) – 5 uS (Max); Pulse rate = 30 Hz (Initial) – 70 Hz (Max).
6. A minimum of three passes with the electrofisher will be utilized to ensure maximum capture probability of salmonids within the area proposed for dewatering, unless the number of fish captured in the second pass is less than 10 percent of the first pass. In that case, two passes are adequate. If steelhead are present on any pass, a minimum of 20 minutes will separate the beginning of each pass through the Project reach to allow time for fish that are not captured to become susceptible to electrofishing again.
7. All captured fish will be held in water with temperatures not greater than ambient in-stream temperatures. If cooling is used, water temperatures will be maintained not more than three degrees Celsius less than ambient in-stream temperatures. All captured fish will be held in well oxygenated water, with a dissolved oxygen level of not less than seven parts per million. Prior to release, the following information shall be recorded: 1) Enumerate fish by species, 2) Visual determination of age of steelhead, 3) Enumerate steelhead injuries and fatalities by age class, 4) Enumerate successfully relocated steelhead by age class for each relocation site, and 5) Date and time of release of steelhead to each relocation site. Steelhead shall be subject to the minimum handling and holding times required. All captured fish will be allowed to recover from electrofishing and other capture gear before being returned to the stream. All captured fish will be processed and released prior to any subsequent electrofishing pass or netting effort.

8. All captured fish will be released upstream of the block nets to facilitate redistribution into dewatered areas following construction activities.

- **PM-6:** During all management or construction activities, Best Management Practices, consistent with those recommended by the Regional Water Quality Control Board and the California Department of Fish and Game, should be adhered to. They include the following:
    1. The contractor shall only use the approved access routes shown on the plans. No persons, equipment, or material shall be allowed outside the designated limits of disturbance.
    2. The stockpile areas for removed sediment that are adjacent to the levee and have potential for entering the active channel shall be fully enclosed with silt fence and boundary fence.
    3. All equipment shall be stored, maintained and refueled in a designated portion of the stockpile area. The contractor shall adhere to a spill prevention plan, to be prepared by the contractor and submitted for review by the engineer.
    4. Contractor shall immediately stop all operations and devote all on-site personnel to the containment and clean up of any fuel, fluid or oil spill, to the satisfaction of the engineer.
    5. The contractor shall be responsible for continuous dust control in accordance with the conditions of the permits. The contractor shall be responsible for the regular cleaning of all mud, dirt, debris, etc., from any and all adjacent roads and sidewalks.
    6. All excess soil shall be disposed of off-site or at locations to be designated in the permit documents.
    7. No debris, rubbish, creosote-treated wood, soil, silt, sand, cement, concrete, or washings thereof, or other construction-related materials or wastes, oil, or petroleum products or other organic material or earthen material shall be allowed to enter into, or be placed where it may be washed by rainfall or runoff into the creek. Any of these materials placed within or where they may enter the creek shall be removed immediately. When construction is complete, any excess material shall be removed from the work area so that such materials do not wash into the creek.
    8. Adequate erosion control measures shall be constructed and maintained to prevent the discharge of earthen materials to the creek from disturbed areas under construction and from completed construction areas. All disturbed areas of bed and bank shall be

stabilized, winterized, and vegetated with appropriate native vegetation prior to the end of the work window.

9. No equipment shall be operated in areas of flowing or standing water. No fueling, cleaning or maintenance of vehicles or equipment shall take place within any areas where an accidental discharge to the creek may occur; construction material and heavy equipment must be stored outside of the ordinary high water mark. All work done within the creek shall be completed in a manner so as to minimize impacts to beneficial uses and habitat; measures shall be employed to minimize disturbances along the channel that will adversely impact the water quality of the creek.

4.5 Beaver management

The beaver is an important mammal to California, as well as to North America, from a historical and aesthetic perspective. Beaver can be beneficial elements of the ecosystem by creating wetland habitat for a variety of wildlife species including fish, birds, amphibians, reptiles, and other mammals. This variety of wildlife is in turn valued for recreational, scientific, educational and aesthetic purposes. This increase in biodiversity of wildlife is a great asset to open space areas and is often highly valued by trail users and residents. In some areas beaver activity is also helpful in retaining storm water runoff and improving water quality by trapping sediment, nutrients, and pollutants. The dams act as natural check dams during floods and high water, reducing erosion and slowing the water enough to encourage sediment deposition. Water behind beaver dams also create additional shoreline and enable water-loving plants and trees to grow and thrive.

Beaver activity can also have detrimental effects. Their actions can sometimes lead to flooding of roads and trails, the loss of trees and shrubs, and the destruction of both public and private property. Their impacts often occur suddenly and dramatically. Beavers are usually not noticed in an area until valuable trees have been felled or flooding occurs. When beavers and their dams are deemed a nuisance, the initial response is to breach the dam. Although this can be a quick fix solution, the dams are usually rebuilt fairly quickly.

In the case of the flood control channel, the presence of beaver dams causes sediment to accumulate in the channel, especially in overbank areas that may not be scoured if the dams are breached. The accumulation of sediment results in less conveyance during a flood event and an increased need to periodically remove sediment.

With regard to aquatic habitat, anecdotal evidence suggests that the beaver dams may enhance rearing habitat for juvenile steelhead by creating deeper pools with complex cover habitat around flooded willows. The downside of the beaver ponds are that they tend to not persist through the entire low flow summer season and they may inhibit outmigration of adult steelhead in the spring, as was the case in the summer of 2008.

The impacts the beaver dams have on flood control in the Arroyo Grande Creek Channel is dramatic. Not only do the dams directly reduce flood conveyance due to the impoundment of water, they result in significant deposition of coarse bed material that builds up in the channel and reduces flood conveyance long term. Because of the confined nature of the constructed flood control channel, loss of conveyance in one area dramatically impacts conveyance upstream for a considerable distance as the zone of sediment deposition propagates upstream. Beaver also may threaten the efficacy of achieving a diverse, continuous, riparian corridor along the Arroyo Grande Creek Channel as they cut down larger trees and create gaps in the canopy.

Although the numbers of beavers currently using the Arroyo Grande Creek Channel and their distribution in the Arroyo Grande system are unknown, their existing and expected future impact is significant enough to warrant active management of the beaver. The District and Zone 1/1A, have, and will, be making a considerable investment in flood management and habitat enhancement measures. Consequently, it has been recommended during preparation of the WMP that active beaver management be included as a tool to ensure that flood control is maintained and that future sediment management activities are not compromised by beaver activity.

Beaver management activities allowed under the WMP would include capture and relocation, removal of existing dams, and where necessary capture and euthanization of individual beavers. If euthanization is used as an alternative to capture and relocation, a depredation permit would be necessary from the California Department of Fish and Game. Beaver management activities will be conducted in a way as to be sensitive to the local community. Beaver management activities in any given year, where feasible, will be specified in the annual work plan prepared for vegetation management activities. Removal of beaver dams will require the same environmental protection measures as vegetation management activities including use of non-mechanized equipment and RLF surveys prior to conducting work. A biological monitor, with a federal permit to handle steelhead, should also be present during dam removal activities in case fish are stranded as a result of the action.

5.0 REFERENCES

Brown, R. 2002. Story of the Arroyo Grande Creek. Published by Robert A. Brown.

Bulger, J. B. 1999. Terrestrial activity and conservation of California red-legged frogs (*Rana aurora draytonii*) in forested habitats of Santa Cruz County, California. Report prepared for Land Trust of Santa Cruz, dated March 2, 1999.

Central Coast Salmon Enhancement. 2005. Arroyo Grande Creek Watershed Management Plan. Prepared for California State Department of Fish and Game. March 2005.

Close, B. and S. Smith, 2004. *Stream Inventory Report, Arroyo Grande Creek Summer 2004*. Prepared for Central Coast Salmon Enhancement.

Cooper, A.C. 1965. The effects of transported stream sediments on the survival of sockeye and pink salmon eggs and alevin. Publ. no. 18. International Pacific Salmon Fisheries Commission; 71 p.

Daykin, P. N. 1965. Application of mass transfer theory to the problem of respiration of fish eggs. Journal of the Fisheries Research Board of Canada 22(1): 159-171.

Dvorsky, J. 2004. Arroyo Grande Creek Watershed Management Plan: Geomorphic and Hydrologic Conditions Assessment – Final Technical Report. Prepared for: Central Coast Salmon Enhancement. December, 2004.

Dvorsky, J. and J. Hagar. 2008. Arroyo Grande Creek Steelhead Distribution & Abundance Study - 2006. Prepared for Central Coast Salmon Enhancement in association with Hagar Environmental Science. March 20, 2008.

Essex Environmental. 2002. 2002 Postsconstruction Monitoring Report for the Arroyo Grande Creek Sediment Removal Project. Prepared for San Luis Obispo County Engineering Department. November 2002.

Flosi, Gary, et al. 1998. California Salmonid Stream Habitat Restoration Manual (3rd edition). Sacramento: State of California Resources Agency Department of Fish and Game.

Hayes, M. P. and M. R. Jennings. 1988. Habitat correlates of distribution of the California red-legged frog (*Rana aurora draytonii*) and the foothill yellow-legged frog (*Rana boylii*): implications for management. *In* R. C. Szaro, K. E. Severson, D. R. Patton (tech. Coords.), Management of Amphibians, Reptiles, and Small Mammals in North America. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Gen. Tech. Rep. RM-166, Fort Collins, Colorado.

Jennings, M. R., and M. P. Hayes. 1994. Amphibian and reptile species of special concern in California. California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova.

McNeil, W. J., and W. H. Ahnell. 1964. Success of pink salmon spawning relative to size of spawning bed material. U.S. Fish and Wildlife Service Special Scientific Report Fisheries 469.

Moyle, P. B. 1973. Effects of introduced bullfrogs, Rana catesbeiana, on the native frogs of the San Joaquin Valley, California.

Rischbieter, D. 2006. Aquatic Survey Arroyo Grande Creek and Lagoon; Oceano Dunes SVRA, Pismo SB Dunes Preserve. February 26-27. California State Parks.

Rischbieter, D. Lower Arroyo Grande Creek and Lagoon Fishery and Aquatic Resources Summary Monitoring Report. December 2004. Oceano Dunes SVRA, Pismo Dunes State Reserve. California State Parks.

Rischbieter, D. Lower Arroyo Grande Creek and Lagoon Fishery and Aquatic Resources Summary 2005 Monitoring Report. January 2006. Oceano Dunes SVRA, Pismo Dunes State Reserve. California State Parks.

Stebbins, R.C. 1985. A field guide to western reptiles and amphibians, 2nd ed. Houghton-Mifflin Company, Boston, Massachusetts.

Stetson Engineers, Inc. 2004. Arroyo Grande Creek Habitat Consercation Plan (HCP) and Environmental Assessement/Initial Study (EA/IS) For the Protection of Steelhead and California Red-Legged Frogs. Prepared for County of San Luis Obispo, Ca. February 2004.

Swanson Hydrology + Geomorphology. 2006. Arroyo Grande Creek Erosion, Sedimentation and Flooding Alternatives Study. Prepared for Coastal San Luis Resource Conservation District. January, 2006.

Swanson Hydrology and Geomorphology, Native Vegetation Network, and Hagar Environmental Sciences. 2002. Lower San Lorenzo River and Lagoon Management Plan. Prepared for: City of Santa Cruz Redevelopment Agency in conjunction with San Lorenzo River Urban Task Force and the State Coastal Conservancy. January, 2002.

Terhune, L.D.B. 1958. The Mark VI Groundwater Standpipe for Measuring Seepage Through Salmon Spawning Gravel. Canada Fisheries Research Board Journal, 15:1027-1063.

U. S. Army Corps of Engineers, Los Angeles District. 1999. Report on Hydrologic Analysis of San Luis Obispo, Santa Rosa, and Arroyo Grande Creeks. Discharge-Frequency Analysis. San Luis Obispo County, California. pp 48 +

U. S. Army Corps of Engineers, Los Angeles District. 2001. HEC-RAS Modeling for Arroyo Grande Creek. San Luis Obispo County, California. pp 75 +

U.S. Census Bureau. (2000). *State & county Quickfacts: San Luis Obispo County, CA.* Retrieved from http://quickfacts.census.gov.

US Fish and Wildlife Service. 2005. Revised Proposed Designation of Critical Habitat for the California Red-Legged Frog (*Rana aurora draytonii*); Proposed Rule. 70 FR 66905 67064. November 3, 2005.

Vaux, W.G. 1962. Interchange of stream and intragravel water in a salmon spawning riffle. US Fish Wild. Serv. Spec. Sci. Rep. Fish. No. 405. 11p.